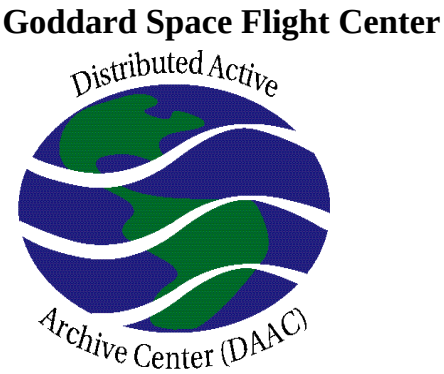
MODIS
V1 Science Software Integration and Test Procedures and Agreement with the Goddard Distributed Active Archive Center



June 18, 1997

SDST-092
Change Notice 1

MODIS V1 SSI&T Procedures and Agreement with the GSFC DAAC

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Change Record Page

This document is baselined and has been placed under Configuration Control. Any changes to this document will need the approval of the SDST Manager and Goddard DAAC Manager.

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MODIS V1 SSI&T Procedures and Agreement with the GSFC DAAC

Table of Contents

List of Figures

List of Tables

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MODIS V1 SSI&T Procedures and Agreement with the GSFC DAAC

1. SCOPE

This document will discuss the planned activities and the roles and responsibilities of each organization during the Science Software Integration and Test (SSI&T) process at the Goddard Space Flight Center (GSFC) Distributed Active Archive Center (DAAC) for the Moderate Resolution Imaging Spectroradiometer (MODIS) Version 1 (V1) Science Data Processing Software (SDP S/W).

1.1 Identification

This document is an agreement between the MODIS Science Data Support Team (SDST) and the GSFC DAAC (GDAAC) as to the acceptance criteria for the SSI&T of the MODIS V1 SDP S/W on the Earth Observing System (EOS) Data Information System (EOSDIS) Core System (ECS). By signing this document, both organizations commit to providing the resources to accomplish the tasks defined and agreed to herein. This document supersedes the "Science Software Integration and Test for the MODIS Instrument at the GSFC DAAC."

1.2 System Overview

The MODIS V1 SDP S/W is the engineering release of software that processes data from the MODIS instrument on the EOS AM-1 satellite. The objective of the engineering release is to demonstrate all major functional capabilities of the MODIS SDP S/W that are scheduled to run at GDAAC and to demonstrate a complete operator interface while consuming realistic computational resources.

Details on MODIS V1 SDP S/W can be found in the "MODIS V1 System Description" document. The current copy of this document is available by request from the SDST Configuration Management Officer (CMO). Details on ECS can be found in "Overview of Release-A SDPS and CSMS System Design Specification" available from the ECS Data Handling System (EDHS) on the World Wide Web (WWW) at Universal Resource Locator (URL): http://edhs1.gsfc.nasa.gov.

1.3 Document Control

Changes to this document shall be made as V1 and the current release of ECS are better understood. Changes may be submitted by anyone on the SDST or GDAAC SSI&T test groups. The following steps will be followed for updating this document:

1. Proposed Configuration Change Requests (CCRs) using the template on the SDST CMO Mac in the CCR Public Folder (or emails in the TO/FROM or IS/WAS format) can be submitted from the GDAAC or MODIS Teams to the SDST CMO (modiscm@ltpmail).

2. SDST CMO will check the CCR (or complete the form) and submit it into the SDST Configuration Control Board (CCB) Process.

3. The SDST Tech Evaluator will work with GDAAC Tech Evaluator to obtain an evaluation. If an agreement can not be achieved between them, the views of both the SDST Evaluator and the GDAAC Evaluator will be included in part C of the CCR and then forwarded to the CCB.

4. SDST CMO is notified when a CCR is ready to be addressed by the CCB.

5. The GDAAC and MODIS personnel will receive email announcing a CCB Meeting. The announcement will include the CCB Agenda. The CCB Agenda is usually sent out on Wednesday for the meeting on the following Monday.

6. Discussions can be held at the CCB Meeting if needed (if the evaluation is agreed upon and there are no issues or concerns, the CCR will be quickly signed off).

7. The CCB Meeting is normally held on Mondays at 1:00 p.m. in the General Science Corporation Conference Room.

8. The CCRs will be signed off (approved; approved as modified; rejected; or cancelled) by the SDST Manager (or designee) and the GDAAC Manager (or designee). The CCRs must be approved by both the GDAAC Manager and the SDST Manager in order to be in effect.

9. The approved changes will be incorporated into the document and the changes will then be released.

1.4 Document Overview

Section 1: Scope, is an overview of this document.

Section 2: Related Documentation, lists documentation that pertains to the SSI&T or is referenced in this document.

Section 3: Overview of V1 SSI&T, provides high-level information about the SSI&T process.

Section 4: SSI&T Activities, discusses the phases of SSI&T and the flow of activities.

Section 5: SSI&T Acceptance Criteria, lists the GDAAC acceptance criteria for MODIS V1 SDP S/W .

Section 6: Test Environment, describes the hardware and software environment in which the MODIS V1 SDP S/W will be tested.

Section 7: Process Management Issues, explains various policies associated with the SSI&T process.

Section 8: Training, outlines the training necessary for V1 SSI&T.

Section 9: Documentation, lists the documentation requirements for the SSI&T process.

Appendix A: Acronyms and Abbreviations, is an explanation of acronyms and abbreviations used in this document.

Appendix B: Prohibited Functions, lists the functions prohibited by the GDAAC for use in the SDP S/W .

Appendix C: Beta Lessons Learned Traceability Matrix, provides a connection between the lessons from the Beta SSI&T and the elements of this document and shows how past errors have been mitigated here.

Appendix D: README Template, provides an example README that meets the requirements for V1 SSI&T.

Appendix E: Environment Variable Definitions in ECS, lists the environment variables that will be defined in ECS and notes which can be changed by the SDP S/W and which cannot.

Appendix F: Preparation E-mail Checklist, lists the items that must be included in the detailed e-mails sent between GDAAC and SDST in the Preparation phase.

Appendix G: Test Analysis Examples, provides examples of the brief test analyses required as part of a delivery.

Appendix H: Makefile Standards, provides the suggested standards for makefiles.

Appendix I: Science Software Directory Tree, illustrates the organization of the SDP S/W .

2. RELATED DOCUMENTATION

2.1 Parent Documents

This document's parent documents are:

- Software Developer's Guide to Preparation, Delivery, Integration and Test with ECS; available from EDHS at URL: http://edhs1.gsfc.nasa.gov.
- Team Leader Working Agreement for MODIS, GSFC 421-12-14-02; April 21, 1994.

2.2 Applicable Documents

Step-by-step instructions for SSI&T activities can be found in the following documents:

- MODIS Version 1 Installation and Operations Guide, SDST-094 (to be written).
- GDAAC V1 Test Procedures, GDAM1-003 (to be written).

Software standards that are tested as part of SSI&T are described in:

- ESDIS Project Data Production Software and Science Computing Facility Standards and Guidelines; 423-16-01.

2.3 Information Documents

The following documents provide background information relating to the V1 SDP S/W , the test environment, and the SSI&T activities and acceptance criteria:

- EOSDIS Core System Project Mission Operations Procedures for the ECS Project, DID 611-CD-002-001 (contains "The Green Book").
- MODIS Science Data Processing Segment Version 1 Requirements Specification; SDST-028A; October 4, 1996.
- MODIS Science Data Processing Software Version 1 System Description; Draft; SDST-065; September 13, 1996.
- Product Generation Executive (PGE) Design Information Page, http://ecsinfo.hitc.com/iteams/pge_wp.html.
- Release A GSFC DAAC Design Specification; DID 305-CD-014-001.

3. OVERVIEW OF VERSION 1 SCIENCE SOFTWARE AND INTEGRATION

This section provides a brief description of the SSI&T activities and participants.

3.1 Science Software Integration and Test Phases

The MODIS V1 SSI&T process consists of ten phases:

1. Preparation – Resource requirements and availability are analyzed; MODIS-specific system elements (Earth Science Data Types [ESDTs]) are defined.

2. Transfer – MODIS V1 SDP S/W is transported from the Team Leader Computing Facility (TLCF) and installed on the GDAAC (SDST controls Configuration Management [CM]).

3. Inspection – The GDAAC Test Team checks completeness and performs standards checking on the Transfer Package.

4. Infusion – SDST builds all transferred PGEs with the Science Computing Facility (SCF) Science Data Processing Toolkit (SDPTK) and runs a functional test on one PGE from each available discipline in the simulated-SCF environment at the GDAAC.

5. Delivery – The Transfer Package is formally delivered through a review to the GDAAC after successful Inspection and Infusion (if applicable). CM control is given to the GDAAC.

6. Integration – Together, the GDAAC Test Team and SDST compile and register all delivered PGEs with the DAAC SDPTK and run a functional test in the Planning and Data Processing System (PDPS) on each PGE run in Infusion.

7. Acceptance Testing – The GDAAC Test Team runs functional, dependency (testing the data interfaces between PGEs), error, and boundary tests on all delivered PGEs.

8. Problem Resolution – Problems found at any time from Transfer on through the end of SSI&T are analyzed and tracked to closure.

9. Regression Testing – Tests are repeated for any PGEs that are re-transferred with modifications. Also, PGEs may be regression tested when ECS is modified.

10. Post-Testing – The GDAAC Test Team performs test analysis, gives a test review, and publishes a test report.

These phases are described in more detail in Section 4. Note that system and SDP S/W stress testing are not part of SSI&T but will be performed after SSI&T.

3.2 Science Software Integration and Test States

During SSI&T, a PGE will be in one of the following states:

- Transferred - The PGE has been transferred to the GDAAC but is not yet ready for delivery.
- Delivered - The PGE has passed Inspection and Infusion testing (if applicable) and has passed the formal Delivery review.
- Conditionally Accepted - A delivered PGE has met all the criteria for conditional acceptance.
- Fully Accepted - A delivered PGE has met all the criteria for full acceptance.
- Regression - A PGE encountered problems during SSI&T and must be or has been re-transferred and must be or is being regression tested.

These states are described in more detail in Section 5.

3.3 Science Software Integration and Test Roles and Responsibilities

SDST and GDAAC will be the two groups participating in this SSI&T. SDST is responsible for providing the V1 SDP S/W. SDST shall transfer the software to the GDAAC and place it under SDST-controlled CM using ClearCase. SDST shall also perform Infusion testing, provide a Delivery Review, and assist with Integration. SDST shall support the software during Acceptance testing by responding to problem reports and providing fixes for the SDP S/W as needed. SDST shall also provide test input data for Acceptance testing as needed.

GDAAC shall assist during the Transfers in placing the SDP S/W on the ECS. GDAAC shall also provide adequate resources for SDST CM and Infusion testing. GDAAC shall perform Inspection testing on the SDP S/W before Infusion. GDAAC shall approve the Delivery Review and lead Integration. GDAAC shall perform Acceptance testing and shall inform SDST through problem reports when there are possible SDP S/W problems. GDAAC shall also provide sustaining engineering for the ECS to ensure a working test environment.

SDST expects to deliver approximately 58 V1 PGEs between 2/18/97 and 12/1/97 and the GDAAC commits to performing SSI&T on all PGEs delivered.

3.4 Science Software Integration and Test Metrics

Collecting metrics during testing provides a baseline for resource estimation for further testing. The following metrics shall be collected during SSI&T:

- Number of bugs (see Section 4.3.8 for details).
- How long it takes to complete each test procedure.
- SDP S/W performance metrics (see Section 4.3.7 for details).

3.5 Science Software Integration and Test Timeframe

The timeframe for SSI&T is from the first Transfer (February 18, 1997) to Version 2 delivery (November 15, 1997)

4. SCIENCE SOFTWARE INTEGRATION AND TEST ACTIVITIES

This section identifies the phases of SSI&T activities, the high-level steps involved in each phase, and the roles and responsibilities associated with each phase.

4.1 Timeline

Figure 4-1 presents a timeline for SSI&T activity phases and how they relate to each other. The phases shown in this timeline are described in more detail in Section 4.2.

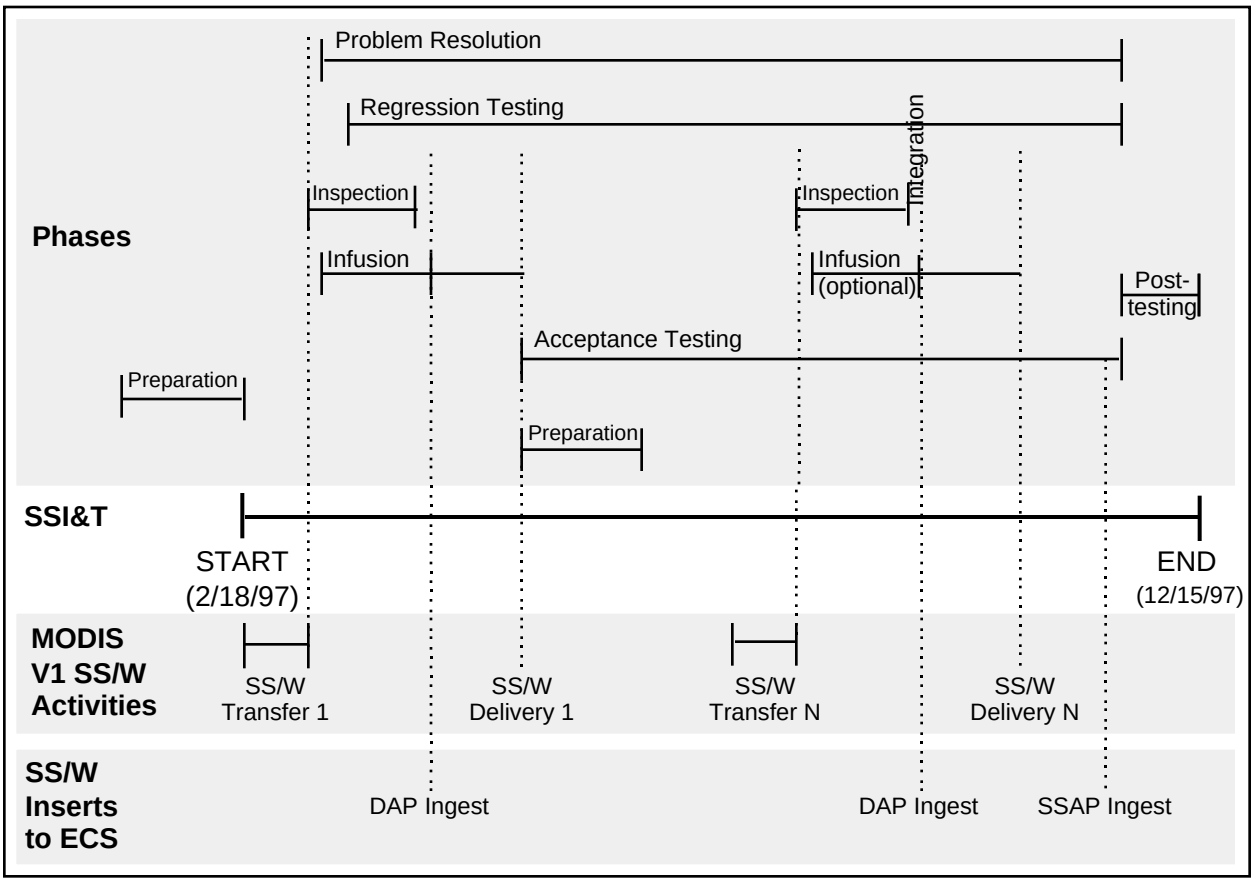

Figure 4-1. Timeline of Activity Phases

The following notes will aid in understanding the timeline:

- Only two transfers are shown on the timeline, but many may occur.
- Inspection and Infusion take place concurrently after the first Transfer phase.

- Integration happens after each delivery.
- Regression Testing can begin as early as the Inspection phase and continues as needed until the entire SSI&T process is complete.
- Not shown on this timeline is the Stress Testing phase. Stress Testing is defined in the “GDAAC Test Plan” but is not a part of the SSI&T timeframe. The GDAAC Test Team and the SDST Test Team shall perform Stress Testing as time allows; any problems detected in the SDP S/W shall be reported through the SSI&T Problem Resolution procedures.

4.2 Activity Overview

The phases shown in Figure 4-2 and the activities associated with each are described in this section through diagrams and a high-level step-by-step chart.

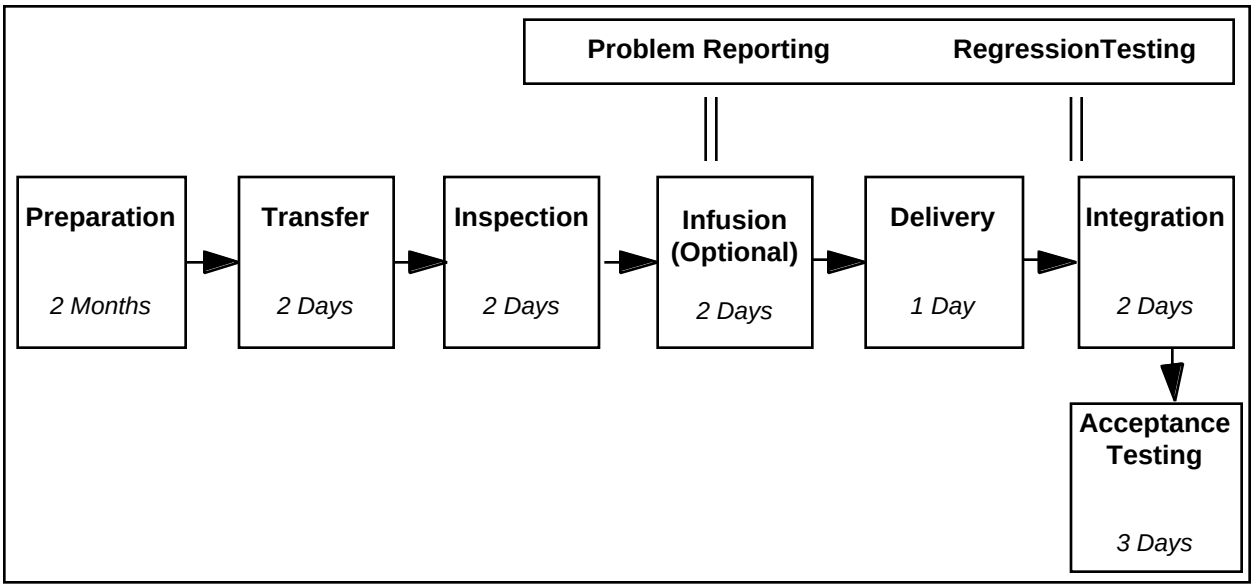

Figure 4-2. SSI&T Lifecycle for One PGE

4.2.1 SSI&T Life Cycle of a Single PGE

Figure 4-2 illustrates a life cycle of the SSI&T for a single PGE. The times to complete each phase are estimates based on Beta SSI&T experience.

4.2.2 Activity Chart

The following chart lists major activities for each phase of SSI&T and may be used as a checklist for SSI&T. Detailed step-by-step instructions for these activities may be

found in the "MODIS V1 Installation and Operations Guide" and in the "GDAAC V1 Test Procedures." Narrative descriptions of each phase are supplied in Section 4.3.

Note the following:

For several e-mail requirements in the Preparation phase, an e-mail item checklist is available in Appendix F. For the purposes of this chart, the ECS Science Office members that help with SSI&T at the GDAAC are considered part of the GDAAC; their activities appear under the heading "GDAAC" and not "Hughes/ECS." Hughes/ECS is not included in this chart, but shall provide support for SSI&T through ECS developers and the ECS Sustaining Engineering group.

4.3 Detailed Descriptions of Activity Phases

The following is a detailed description of the activity phases previously identified in the timeline and charts. Step-by-step instructions for these phases may be found in the "MODIS V1 Installation and Operations Guide" and in the "GDAAC V1 Test Procedures."

4.3.1 Preparation

Phase Step:	**Activity (Roles and Responsibilities)**
Step 1: START - 2 months	GDAAC assesses the resources projected to be available for Release A and sends an e-mail to SDST with these projections. (See Appendix F) (Two months before scheduled start of SSI&T: 12/15/96)

Roles and Responsibilities	
SDST	GDAAC
·	· Research the system · Deliver draft documents · E-mail to SDST · Request any necessary test input data

Step 2:	SDST sends e-mail acknowledging receipt of system resource projections.

Roles and Responsibilities	
SDST	GDAAC
· E-mail to DAAC	·

Phase Step:	Activity (Roles and Responsibilities)

Step 3: SDST notifies GDAAC, ECS and the Earth Science Data and Information System (ESDIS) Project of SDST's intention to conduct SSI&T via an Operations Support Request with information regarding the time frame, size and scope of the transfer, and required resources. SDST also provides GDAAC with drafts of "MODIS V1 Installation and Operations Guide" and "MODIS V1 System Integration and Test (I&T) Plan." (See Appendix F) (Four weeks before scheduled start of SSI&T: 1/15/97)

Roles and Responsibilities	
SDST	GDAAC
· E-mail to GDAAC	·

Step 4: GDAAC responds with an assessment/approval of SDST's stated intentions and requirements and includes specific information about how to make the transfer. Notice should include method of software transfer. (See Appendix F) (Three weeks before scheduled start of SSI&T: 1/22/97)

Roles and Responsibilities	
SDST	GDAAC
·	· Respond to TLCF (cc: ESDIS Project and ECS on staffing and potential machine limitations (CPU, disk, network)

Step 5: SDST provides confirmation of and/or refinements to the planned transfer schedule to GDAAC (cc: ECS and ESDIS Project) as well as details about the transfer. (See Appendix F) (Two weeks before scheduled start of SSI&T: 1/29/97)

Roles and Responsibilities	
SDST	GDAAC
· E-mail to ESDIS Project, ECS, and GDAAC	· Provide personal account information as early as possible

Step 6: GDAAC acknowledges receipt of transfer confirmation message.

Roles and Responsibilities	
SDST	GDAAC
·	· E-mail sent to SDST · Sets up accounts for UNIX, DCE, and ClearCase

In the Preparation phase, GDAAC and SDST personnel investigate the resource requirements. In order to estimate the ECS resources that will be available, the GDAAC Test Team Lead gathers information from ECS about the hardware and software that will be delivered. Two months before the scheduled start of SSI&T, the GDAAC Test Team Lead shall send the analysis to the SDST Test Lead.

SDST shall estimate the resources required for V1. Four weeks before the first Transfer phase begins, the SDST Test Lead shall send the analysis to the GDAAC Test Team Lead via e-mail. The GDAAC Test Team Lead shall respond with an e-mail one week later explaining how the estimated resource requirements can be met by the scheduled start of SSI&T. (See Appendix F for an e-mail checklist.) Two weeks before the scheduled start of SSI&T, SDST provides any updates to the "MODIS V1 Installation and Operations Guide."

Entry Criteria: This document is baselined.

Exit Criteria: All required e-mails have been sent and the first Transfer Package is ready.

4.3.2 Transfer

Phase Step: | **Activity (Roles and Responsibilities)**

Step 7: SDST brings SDP S/W to GDAAC.

Roles and Responsibilities	
SDST	GDAAC
· Bring SDP S/W	· Sets up accounts under UNIX and DCE.

Step 8: SDST installs SDP S/W on test environment.

Roles and Responsibilities	
SDST	GDAAC
· Installation	· Maintenance & Operations (M&O) support

Step 9: SDST puts SDP S/W under SDST-controlled CM.

Roles and Responsibilities	
SDST	GDAAC
· Configuration Management (CM)	· M&O support

This section explains the Transfer phase and what will comprise each Transfer. A Transfer in V1 SSI&T is defined as a physical transport of SDP S/W from the TLCF to the GDAAC and the subsequent installation of the SDP S/W on the test environment. A Transfer Package shall not contain any PGEs that have not already passed TLCF testing.

Currently a minimum of two separate Transfer Packages are expected between the GDAAC and TLCF for the MODIS V1 SDP S/W . The first Transfer Package, which is scheduled to arrive at GDAAC on February 18, 1997, shall include the following:

- Only PGEs that will run operationally at the GDAAC that have been received and completed testing at the TLCF a minimum of two weeks prior to the transfer date to the GDAAC. The following processes shall be included in the first Transfer Package:
  - PGE2: Level 1B (L1B) Calibration,
  - PGE3: L2 Cloud Mask/Profiles,
  - PGE7: L2 Snow,
  - PGE8: L2 Sea Ice,
  - PGE12: L2G Pointers.
- One master Process Control File (PCF) per PGE.
- Metadata Configuration Files (MCFs).
- All supporting simulated data necessary to test the PGEs being included in the Transfer Package (input data sets and ancillary data).
- All TLCF test scripts, test compilation logs, output result files, brief test analyses, usage statistics, and any supporting test documentation for each PGE.
- M-API.
- The MODIS PCF template.
- Documentation listed in Section 9.2.

All files within the Transfer Package shall be contained in compressed tar files (one per PGE and if needed, one common) whose names include the following information:

- MODIS,
- SDP S/W version number (V1),
- Transfer date,
- PGE number identification field or “common.”

Subsequent Transfer Packages shall include:

- PGEs that will run operationally at the GDAAC that have been received and tested at the TLCF that were not included in the previous Transfer Packages.

- Any updated PGEs that were modified since the first receipt of that PGE based on problems found during DAAC or TLCF testing.
- All supporting simulated data necessary to test the PGEs being included in the Transfer Package (input data sets and ancillary data).
- All TLCF test scripts, output result files, usage statistics, and any supporting documentation for each PGE.

Every effort shall be made to include potentially problematic PGEs identified during TLCF testing in earlier Transfer Packages in order to allow more time for their I&T at the GDAAC. Any PGEs that are being re-transferred with modifications (either due to a problem found during SSI&T or to a problem found at the TLCF after initial transfer) shall contain the documentation listed in Section 4.3.8.

Details on the actual contents of the Transfer Packages may be found in the "MODIS V1 Installation and Operations Guide." The Transfer Package shall be uploaded onto the staging area either via tape tor by an ftp transfer (details on the method of transfer shall be contained in the e-mail sent from SDST to the GDAAC in the Preparation phase, Step 6). SDST, with the assistance of M&O staff, shall uncompress and untar the transfer files into the appropriate simulated-SCF test environment, shall set the files' owners, groups, and permissions, and shall initiate SDST-controlled CM as described in Section 7.1.1.

Entry Criteria: First Transfer: Preparation is complete.

Subsequent Transfers: New and/or modified PGE(s) completes testing at the TLCF and is ready for transfer.

Exit Criteria: All elements of the Transfer Package have been transferred to the ECS and have been placed under SDST CM.

4.3.3 Inspection

Phase Step:	**Activity (Roles and Responsibilities)**
Step 10:	GDAAC checks the entire Transfer Package for completeness and accuracy.

Roles and Responsibilities	
SDST	GDAAC
·	· Inspection

Phase Step:	Activity (Roles and Responsibilities)
Step 11:	GDAAC checks software for presence of prohibited functions.

Roles and Responsibilities	
SDST	GDAAC
.	· Inspection

Step 12:	GDAAC checks software for prologs.

Roles and Responsibilities	
SDST	GDAAC
.	· Inspection

Step 13:	GDAAC checks for correct file name extensions.

Roles and Responsibilities	
SDST	GDAAC
.	· Inspection

Step 14:	GDAAC examines software for mapping of one PCF per PGE.

Roles and Responsibilities	
SDST	GDAAC
.	· Inspection

Step 15:	GDAAC checks PCFs for correct syntax.

Roles and Responsibilities	
SDST	GDAAC
.	· Inspection

Step 16:	GDAAC checks PGEs for correct use of environment variables.

Roles and Responsibilities	
SDST	GDAAC
.	· Inspection

Phase Step:	Activity (Roles and Responsibilities)
Step 17:	GDAAC checks makefiles for compliance with agreed-upon standards.

Roles and Responsibilities	
SDST	GDAAC
·	· Inspection

Step 18:	GDAAC checks FORTRAN 77 software for ESDIS compliance (successful compilation checks ANSI compliance for C and Fortran 90 programs and occurs in Integration or Acceptance Testing since there is no stand-alone tool installed at the GDAAC to check Fortran 90 or C).

Roles and Responsibilities	
SDST	GDAAC
·	· Inspection

The Inspection phase is led by the GDAAC and occurs as soon as the Transfer phase is complete. The GDAAC Test Team shall inspect the software according to the acceptance criteria set forth in Section 5. Step-by-step instructions for Inspection may be found in the "GDAAC V1 Test Procedures." Initially, the Transfer Package is inspected as a whole for such things as correct directory structure; then, individual PGEs are inspected. As each PGE passes Inspection, SDST shall be notified and may begin Infusion on that particular PGE.

Because of this tight dependency of Infusion on Inspection, the Inspection schedule shall be coordinated on a daily basis between the GDAAC and SDST. Also, the PGEs that are targeted for Infusion testing shall be inspected first.

Although this phase is led by GDAAC, SDST remains in charge of CM. The Inspection shall be performed on every Transfer Package received from the TLCF.

Entry Criteria: Transfer is complete.

Exit Criteria: The Transfer Package and all PGEs have passed all Inspection tests.

4.3.4 Infusion

Phase Step:	Activity (Roles and Responsibilities)
Step 19:	SDST builds all PGEs and all utility software and libraries in simulated-SCF test environment using the SCF SDPTK.

Roles and Responsibilities	
SDST	GDAAC
· Build the software (Activity Lead)	· Provide support

Step 20:	SDST runs a functional test on each PGE built in Step 19 in the simulated-SCF environment and checks output files for their exact match to comparison output files.

Roles and Responsibilities	
SDST	GDAAC
· Testing (Activity Lead)	· Provide support

The Infusion process begins on a particular PGE once that PGE has passed the Inspection phase. During Infusion, a functional test is run in a simulated-SCF environment on one PGE from each available discipline linked with the SCF version of the SDPTK.

Infusion is performed on every Transfer Package received from the TLCF only if the Transfer Package contains PGEs that DO NOT already exist at the GDAAC. If a Transfer Package only contains updates to PGEs already integrated at the GDAAC, upon completion of Inspection, the PGEs will immediately go into the Integration phase.

Entry Criteria: A PGE has passed Inspection.

Exit Criteria: One PGE from each available discipline has been successfully built and run.

4.3.5 Delivery

Phase Step:	Activity (Roles and Responsibilities)
Step 21:	SDST presents a delivery review to GDAAC, including details about problems and anomalies in the delivery.

Roles and Responsibilities	
SDST	GDAAC
· Present the review	· Attend the review

Step 22:	SDST presents a delivery review to GDAAC, including details about problems and anomalies in the delivery.

Roles and Responsibilities	
SDST	GDAAC
· Provide further information if requested	· Accept the review or provide guidance for review modification

Step 23:	SDST hands-off the Delivery Package, which includes updated documents and infusion testing documentation.

Roles and Responsibilities	
SDST	GDAAC
· Hand-off	·

Step 24:	GDAAC CMO checks all delivered PGEs into the GDAAC VOB and labels them “delivered.”

Roles and Responsibilities	
SDST	GDAAC
· Hands-off CM	· Initiates CM

The following criteria must be met for a Transfer Package to be ready for delivery:

- All components of the package have been tested at the TLCF and are under CM control at the TLCF.
- All components have passed Inspection.

- All PGEs that were tested during Infusion passed the acceptance criteria 1.1 through 1.4 and 2.1 through 2.11.

Details on the acceptance criteria for these phases are provided in Section 5.

When Infusion is complete, the SDST Test Lead shall inform the GDAAC Test Team Lead of SDST's readiness to make a delivery. The SDST Test Lead shall then present a delivery review in which the SDST Test group provides a report on the following:

- A summary of the test results so far.
- Special instructions for any PGEs not already demonstrated during Infusion.
- A summary of any problems already encountered or potential problems.

If the GDAAC Test Team Lead does not accept the delivery review, the GDAAC Test Team Lead shall provide recommendations to the SDST Test Lead for improving the delivery. Once the SDST Test Lead has implemented these recommendations or negotiated with the GDAAC Test Team Lead for waivers, the delivery review shall be held again.

The first Delivery Package shall include all elements of the Transfer Package (4.2.3) and also the documentation listed in 9.2. Subsequent Delivery Packages shall include all elements of subsequent Transfer Packages and any necessary updates to the documentation listed in 9.2.

Once the Delivery Review has been accepted, the PGEs' status changes from Transferred to Delivered. The GDAAC CM shall insert the delivered software into the Version Object Based (VOB) named "GDAAC" and label it "delivered."

Although the GDAAC controls the CM of delivered files, GDAAC shall not make any modifications to the files other than updates to files re-transferred from SDST or modifications formally directed by SDST via e-mail. GDAAC-generated requests to modify delivered files shall be initiated through a Distributed Defect Tracking system (DDTs) report.

This description applies to all planned deliveries.

Entry Criteria: Inspection and Infusion are complete.

Exit Criteria: GDAAC has approved the Delivery Review and the delivered software has been placed under GDAAC-controlled CM.

4.3.6 Integration

Phase Step:	Activity (Roles and Responsibilities)
Step 25:	GDAAC and SDST build all PGEs, utility software, and libraries on system using the DAAC SDPTK.

Roles and Responsibilities	
SDST	GDAAC
· Observe and support	· Build the software. (Activity Lead)

Step 26:	GDAAC and SDST register all PGEs (this procedure includes multiple tasks from the Green Book).

Roles and Responsibilities	
SDST	GDAAC
· Observe and support	· Enter data (Activity Lead)

Step 27:	SDST and GDAAC run functional tests on all PGEs that were tested in Infusion.

Roles and Responsibilities	
SDST	GDAAC
· Observe and support	· Testing (Activity Lead)

The Integration phase is led by the GDAAC Test Team. In the Integration phase, each PGE that was run with a functional test in Infusion is linked with the DAAC SDPTK and run within the full PDPS of the ECS system. The steps that the PGE follows in Integration are spelled out in the “GDAAC V1 Test Procedures” document.

Entry Criteria: Delivery is complete.

Exit Criteria: All PGEs have successfully compiled with the DAAC SDPTK and the PGEs that were run in Infusion have been run in the PDPS and met all Acceptance Criteria through 2.14.

4.3.7 Acceptance Testing

Phase Step:	Activity (Roles and Responsibilities)
Step 28:	GDAAC runs SDST-defined functional tests on delivered PGEs within the ECS PDPS.

Roles and Responsibilities	
SDST	GDAAC
· Provide support	· Testing

Step 29:	GDAAC links one or more dependent PGEs within the ECS PDPS.

Roles and Responsibilities	
SDST	GDAAC
· Provide support	· Testing

Step 30:	GDAAC runs boundary tests on delivered PGEs within the ECS PDPS.

Roles and Responsibilities	
SDST	GDAAC
· Provide support · Assist with input test data development.	· Testing

Step 31:	GDAAC runs error tests on delivered PGEs within the ECS PDPS.

Roles and Responsibilities	
SDST	GDAAC
· Provide support · Assist with input test data development.	· Testing

Acceptance Testing shall perform the same functional tests as were used in Integration on all PGEs that were not tested in Integration. Also, all delivered PGEs shall be run with dependency, error, and boundary tests. Both Acceptance Testing and Integration shall gather the following information:

- Command.
- Exit Status.

- Elapsed Time.
- User Time.
- System Time.
- Maximum Resident Set Size (maximum memory use).
- Average Shared Text Size.
- Average Unshared Data Size.
- Average Unshared Stack Size.
- Number of Page Reclaims.
- Number of Page Faults.
- Number of Swaps.
- Number of Block Input Operations.
- Number of Block Output Operations.
- Number of Messages Sent.
- Number of Messages Received.
- Number of Signals Received.
- Number of Voluntary Context Switches.
- Number of Involuntary Context Switches.

During Acceptance testing, the following tests shall be performed on all PGEs:

- Functional
- Boundary
- Error
- Dependency

The dependency testing will start by running a PGE using test input data produced by another PGE on which it is dependent. All such valid combinations of two PGEs will be tested first. Once a combination of two PGEs is successful, a thread of three dependent PGEs shall be tested, and so on. Dependency testing shall continue until a full thread of MODIS processing from L1A through L4 is tested; this constitutes an “end-to-end” test.

Entry Criteria:	Integration has been completed.
Exit Criteria:	All PGEs have successfully met all acceptance criteria in the PDPS.

4.3.8 Problem Reporting

Phase Step:	Activity (Roles and Responsibilities)
Step 32:	Tester opens Distributed Defect Tracking system (DDTs) report.

Roles and Responsibilities	
SDST	GDAAC
· DDTs (if applicable)	· DDTs (if applicable)

Step 33:	SDST responds with acknowledgment e-mail to tester and GDAAC Test Team Lead within two business days.

Roles and Responsibilities	
SDST	GDAAC
· E-mail	·

Step 34:	SDST updates status of problem report via e-mail to GDAAC Test Team Lead on weekly basis until problem is closed or deferred to V2.

Roles and Responsibilities	
SDST	GDAAC
· E-mail	·

Problem Resolution is the ongoing phase in which problems are reported, analyzed and resolved. Problems may be reported by SDST or by GDAAC using the ECS DDTs V1 SSI&T database.

The ECS DDTs V1 SSI&T database shall not be directly integrated with the SDST TLCF DDTs database; however, the fields defined for both databases are the same to make the two tools have a common look.

When a problem occurs during any phase of SSI&T, initial analysis shall be performed by the tester to determine whether the problem is due to operator error, the test environment, or the SDP S/W . If the problem appears to be due to SDP S/W , the tester shall use DDTs to open a problem report and notify SDST.

Acceptance Testing presents a special case: if a problem is found during Acceptance Testing on a PGE that was not compiled and tested during Infusion, simulated-SCF testing may be performed before a problem report is filed so that the tester may provide more information in the problem report.

Figure 4-4 depicts the activity flow through the Problem Resolution phase.

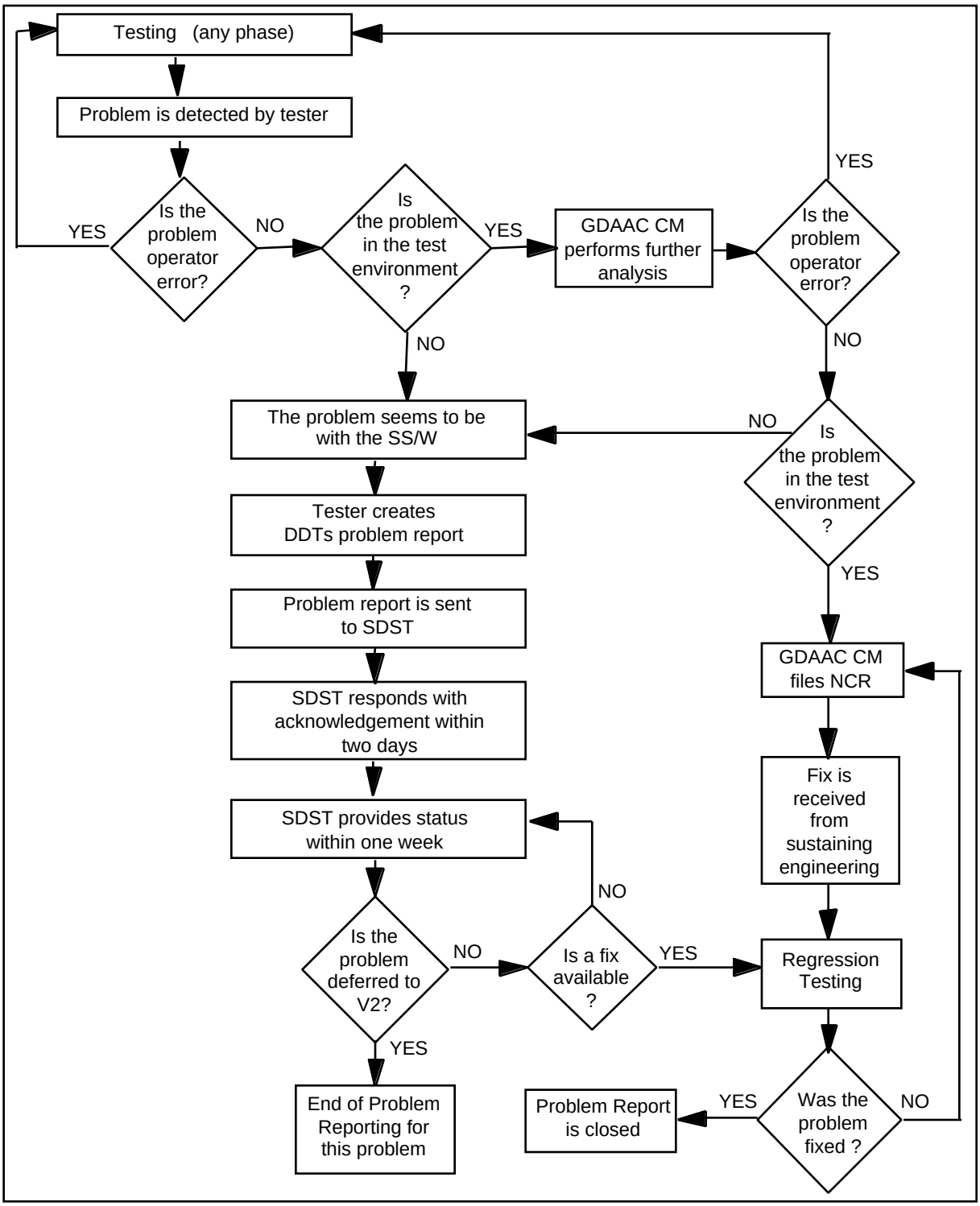

Figure 4-4. Problem Reporting Flow

Once SDST receives notification of a problem through DDTs, SDST shall respond to the originator, with a copy to the GDAAC Test Team Lead, stating that the problem report was received and is being analyzed. This response shall occur within two business days of receiving the initial problem report.

Initial problem analysis shall be provided by SDST to the originator of the problem report and the GDAAC Test Team Lead within five business days of receiving the original problem report. Resolution status for all unresolved problem reports shall continue to be updated weekly unless the problem report is deferred to V2.

Details on how to transfer a software fix (such as on which computer to place it and in which directory) shall be provided in the GDAAC e-mail to SDST in the Preparation phase in Step 5 (see Appendix F for details). The SDST CM shall then notify the GDAAC CM once the files have been placed in the staging area and are ready for regression testing. Documentation shall accompany the transferred files containing the following information:

- The DDTs reference number for the original problem being fixed.
- A brief description of the fix that was performed.
- A list of which files were affected and are being transferred, created the same way as the master packing list (described in acceptance criterion 1.2).
- Test procedures, test compilation output, test results, brief test analyses (see Appendix G), test input data, and comparison output data from the TLCF tests performed on the fixed software.
- Any new instructions for using the modified software or notice that the original instructions still apply.
- Descriptions of any PGEs, products or files that are affected by this fix and how they are affected.

When a problem is generated during Transfer, Inspection, or Infusion, SDST shall manage the version control of newly transferred, modified files. When a problem is generated during Integration, Acceptance Testing, or Regression Testing, the GDAAC CM shall respond to the SDST CM with an e-mail stating that the software was received. The newly transferred files shall then be placed in ClearCase in the "GDAAC" VOB with the label "regression". Once the affected PGE passes Regression Testing, it is labeled “transferred,” “delivered,” “conditionally accepted,” or “fully accepted,” depending on which state had been achieved when the problem was first reported.

If a problem detected during any phase is suspected to be with the ECS system, the tester who detected the problem shall enter a description of the problem in the GDAAC V1 DDTs database and shall send it to the GDAAC CM. The GDAAC CM shall then determine whether to analyze the problem further or to enter the problem into the ECS trouble-ticketing problem reporting system. The GDAAC CM shall be the only person to file trouble tickets in order to control the amount and quality of problem reporting traffic going to ECS. Once a trouble ticket is filed, its status shall be tracked on the original DDTs report.

Metrics on the number of bugs found during each phase shall be collected to help analyze the SSI&T process itself. Bug measurement during V1 SSI&T shall be according to the following criteria:

- A single DDTs problem report sent to SDST containing a problem that was not previously reported to SDST that was not later determined to be due to operator error.
- A single trouble ticket submission to ECS reporting one problem that had not been previously reported to ECS that was not later determined to be due to operator error.

Due to the need to collect metrics, only one problem shall be reported in each DDTs report and in each trouble ticket. In Beta SSI&T, problem reporting was confusing because GDAAC's SSI&T procedures required multiple problem reports during one procedure, sometimes resulting in different aspects on one problem being reported on separate problem reports. To prevent this in V1 testing, test procedures will be written to minimize this problem.

Entry Criteria: A problem is detected in transferred SDP S/W .

Exit Criteria: SSI&T is complete and all problems are closed or deferred.

4.3.9 Regression Testing

Phase Step:	**Activity (Roles and Responsibilities)**
Step 35:	Tester runs regression tests according to Table 4-1.

Roles and Responsibilities	
SDST	GDAAC
· Testing or support (depending on phase)	· Testing or support (depending on phase)

Whenever software is re-transferred from the TLCF (either due to a fix for a problem found during SSI&T or due to a fix for a problem found at the TLCF) Regression Testing must be performed. When a patch is delivered for ECS, Regression Testing may be performed.

If a PGE enters Regression Testing during Transfer, Inspection, or Infusion, the CM designation of regression testing status for the relevant files is controlled by SDST. If a PGE enters Regression Testing in any phase after delivery, the GDAAC CM shall label the relevant files as "regression" in the ClearCase "GDAAC" VOB.

The only time that Regression Testing does not have to be performed after a problem is found is when the problem is due to operator error; at that point, the relevant test

should simply be re-run. The operator error shall be informally documented through a log file and testing shall continue. If a DDTs problem report was generated, it shall be closed by the GDAAC CM.

The actual testing components of Regression Testing that must be performed on any given PGE vary depending on how far into testing the PGE was when the problem was found. Table 4-1 shows which tests must be performed for problems found in each phase.

Table 4-1. Regression Testing Matrix

Phase in which Problem Was Found	Required Regression Test Phases
Inspection	· Inspection
Infusion	· Inspection · Infusion
Integration	· Inspection · Infusion (optional) · Integration
Acceptance Testing	· Inspection · Infusion (optional) · Acceptance Testing

Note that a PGE whose problem was detected during Acceptance Testing does not have to go through Integration Regression Testing; that is because Acceptance Testing covers the same tests as Integration Testing.

Once a PGE has completed Regression Testing, the GDAAC CM shall change its label in the ClearCase "GDAAC" VOB to the state the PGE had achieved when the problem was found, if the problem was found in any phase after Delivery. If the problem was found during Transfer, Inspection, or Infusion it is up to SDST as to how or if the files are labeled once they have completed Regression Testing.

Note that an ECS patch presents a special case of Regression Testing. In the event of an ECS patch, the GDAAC Test Team Lead shall determine which PGEs, if any, shall be Regression Tested to test the patch. Details on Regression Testing documentation are in the “GDAAC V1 Test Procedures.”

Entry Criteria: A file is re-transferred.

Exit Criteria: SSI&T is complete.

4.3.10 Post Testing

Phase Step:	Activity (Roles and Responsibilities)
Step 36:	GDAAC announces completion of testing through e-mail sent to SDST and ESDIS.

Roles and Responsibilities	
SDST	GDAAC
·	· E-mail to SDST and ESDIS (cc: ECS)

Step 37: GDAAC performs analysis on test results.

Roles and Responsibilities	
SDST	GDAAC
· Provide support	· Analyze the results

Step 38: GDAAC presents test review to SDST and ESDIS.

Roles and Responsibilities	
SDST	GDAAC
· Attend the presentation	· Present the results

Step 39: GDAAC writes test report.

Roles and Responsibilities	
SDST	GDAAC
·	· Write test report

Step 40: GDAAC provides information on Version 2 (V2) acceptance criteria based on V1 SSI&T.

Roles and Responsibilities	
SDST	GDAAC
·	· Acceptance criteria

During the Post Testing phase, GDAAC test personnel, with support from SDST, shall analyze the V1 SSI&T test effort. The analysis shall be presented in a test report, in a test review for ESDIS, GDAAC, and SDST management, and in lessons learned. The test report shall be posted on the WWW. The lessons learned shall be communicated

to SDST, GDAAC management and ESDIS. The lessons learned shall be used in preparation of the V2 SSI&T Agreement.

Entry Criteria: SSI&T is complete.

Exit Criteria: The test report, lessons learned, and test review have been delivered.

5. SCIENCE SOFTWARE INTEGRATION AND TEST ACCEPTANCE CRITERIA

The SSI&T process is meant to ensure that the V1 SDP S/W has sound engineering and can run within the ECS environment. The "Team Leader Working Agreement" defines the characteristics of V1 SDP S/W as follows:

> "Programs shall demonstrate all the major functional capabilities and a complete operator interface, including the generation of all needed messages using standard error and message services. This version shall require realistic computational resources, near those of Version 2."

The following characteristics are derived from this objective and will be tested:

- Operability.
- Portability.
- Reliability.
- Maintainability.

All of the acceptance criteria listed in Sections 5.1 and 5.2 are detailed acceptance criteria derived from these characteristics.

5.1 Transfer Package Acceptance Criteria

Before any individual PGEs can be tested, the entire Transfer Package must be tested in the Inspection phase to meet certain acceptance criteria. These acceptance criteria are listed in Table 5-1. If any of these acceptance criteria are not met, SDST shall be notified via a Problem Report and shall bring a new Transfer Package to the GDAAC within five business days.

5.2 PGE Acceptance Criteria

There are two levels of acceptance that a PGE may achieve during V1 SSI&T: Conditional Acceptance or Full Acceptance.

To achieve Conditional Acceptance, a PGE must meet all the acceptance criteria in Table 5-2 successfully. To achieve Full Acceptance, a PGE must meet all the acceptance criteria in Tables 5-2 and 5-3. If a PGE meets all the acceptance criteria in Table 5-2 but only some of the acceptance criteria in Table 5-3, it has only achieved Conditional Acceptance.

All instances of non-compliance with these acceptance criteria shall generate a Problem Report. Any PGE that has not met all of the acceptance criteria in Tables 5-2 and 5-3 is not yet accepted.

Please note that in both tables, every acceptance criterion may also be tested during Regression Testing as well as during the listed related SSI&T phases.

Table 5-1. Transfer Package Acceptance Criteria

Ref #	Acceptance Criteria [Rationale]	Related SSI&T *Phase*/Test Tool	Next Steps
1.1	The directory structure of the transfer package shall match the directory structure documented in Appendix I. [maintainability]	*Inspection*/Visual inspection	**Compliance** The next Inspection activity may be performed. **Non-compliance** Testing shall stop until SDST transfers a new Transfer Package with a directory structure that matches that documented or until SDST updates this document with a directory structure that matches that in the Transfer Package.
1.2	When compared to the delivered packing list using the UNIX command "`diff`", the results of the UNIX command "`ls -alR >` packing.list.inspection" shall yield no differences other than file creation dates and UNIX permissions. [maintainability]	*Inspection*/`diff`	**Compliance** The next Inspection activity may be performed. **Non-compliance** Testing shall stop until SDST transfers a new packing list that matches the current Transfer Package or until SDST transfers a new Transfer Package that matches the packing list.
1.3	The Transfer Package shall contain only the following: · source code files specific to a PGE · header files specific to a PGE · test input data specific to a PGE · comparison output files specific to a PGE · scripts specific to a PGE · makefiles · documentation · libraries · PCFs · Metadata Configuration Files (MCFs)	*Inspection*/Visual inspection	**Compliance** The next Inspection activity may be performed. **Non-compliance** Testing shall stop until SDST transfers a new Transfer Package without the disallowed elements or until SDST removes the disallowed elements from the current Transfer Package.

Ref #	Acceptance Criteria [Rationale]	Related SSI&T *Phase*/Test Tool	Next Steps
1.3 (cont)	(For instance, the Transfer Package shall not contain: · system files and files that begin with a . (such as .cshrc) · files that are user-specific (such as e-mail) · empty (zero-length) files · backup directories · CM files or directories (such as RCS or CVS) · executable files · object files · SDPTK files other than SMF or MCF files that are directly related to a PGE · hardware-specific code or files – except for within makefiles) [operability, portability]		
1.4	The transferred documentation shall contain all elements listed in Section 9.2 for transferred documents. [operability, portability]	*Inspection*/Visual inspection	**Compliance** Testing may continue. **Non-compliance** Testing may continue, but non-compliant elements of the documentation must be fixed by Delivery.

Table 5-2. Acceptance Criteria for Conditional Acceptance for a PGE

Ref #	Acceptance Criteria (Rationale)	Related SSI&T *Phases*/Test Tool	Next Action
2.1	Files within the PGE subdirectory/pge## and its subdirectories shall not contain any prohibited functions in the list in Appendix B unless the prohibited function is in a comment line. This includes MODIS-specific libraries and scripts. (operability)	*Inspection*/ECS SSI&T Prohibited Function Checker	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE shall be deferred until SDST re-transfers the non-compliant files without prohibited functions or until all other PGEs have completed testing or are in a similar hold mode; however, until these problems are corrected, this PGE cannot be accepted.
2.2	All C source code, FORTRAN77 source code, Fortran 90 source code, make, Perl, Korn shell and C shell files shall contain ESDIS-standard prologs at the beginning of each module as defined in the ESDIS SCF Standards and Guidelines. (maintainability)	*Inspection*/ECS SSI&T Prolog Extractor (for files with .c, .f or .f90 extensions; visual inspection for all others) (Note that prolog syntax is not checked by the Prolog Extractor. Whether or not this will be checked by the testers through visual inspection is TBD.)	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE shall be deferred until SDST re-transfers the files with corrected prologs or until all other PGEs have completed testing or are in a similar hold mode; however, until these problems are corrected, this PGE cannot be accepted.
2.3	All C filenames shall end with .c; all FORTRAN 77 filenames shall end with .f77; all Fortran 90 filenames shall end with .f90; all make filenames shall end with .mk; all Perl filenames shall end with .pl; all Korn shell filenames shall end with .ksh; and all C shell filenames shall end with .csh. (inspection, visual inspection)	*Inspection*/Visual inspection	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE shall be deferred until SDST re-transfers the files with corrected filenames or until all other PGEs have completed testing or are in a similar hold mode; however, until these problems are corrected, the PGE cannot be accepted.

Ref #	Acceptance Criteria (Rationale)	Related SSI&T *Phases*/Test Tool	Next Action
2.4	Only one PCF shall be in the directory /pge_cfg. (If multiple PCFs are used to describe production rules, these PCFs must be in the /SCF_PCFs subdirectory along with documentation explaining their use. They may not be in the /pge_cfg directory.) (operability)	*Inspection*/Visual inspection	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE shall be deferred until SDST re-transfers the contents of this subdirectory with only one PCF or until SDST removes the extraneous PCFs.
2.5	The PCF in /pge_cfg shall pass the PCF checker without errors based on the MODIS SDPTK 5.1 PCF template and shall include all lines in the MODIS template (the acceptability of warnings shall be decided on a case-by-case basis by the GDAAC Test Lead). (operability)	*Inspection*/ Visual inspection ECS SSI&T PCF Checker	**Compliance** Testing on this PGE may continue. **Non-compliance** If the PCF checker only produced warnings, testing on this PGE shall be deferred until SDST re-transfers a compliant PCF or until all other PGEs have completed testing or are in a similar hold mode; if the PCF checker produced errors, testing on this PGE shall stop until SDST re-transfers a compliant PCF.
2.6	The PGE shall not modify the ECS system environment variables listed in Appendix E.	*Inspection*/Visual inspection	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE shall stop until SDST re-transfers the files which modify environment variables as compliant files.
2.7	Makefiles shall follow the standards in Appendix H. (maintainability)	*Inspection*/Visual inspection	**Compliance** Testing on this PGE may continue. **Non-compliance** The GDAAC Test Lead shall determine whether testing on this PGE stops until SDST re-transfers the non-compliant makefiles as compliant makefiles or if it is deferred until SDST re-transfers the compliant makefiles or until all other PGEs have completed testing or are in a similar hold mode.

Ref #	Acceptance Criteria (Rationale)	Related SSI&T *Phases*/Test Tool	Next Action
2.8	All C source code, FORTRAN 77 source code, and Fortran 90 source code files shall be fully compliant with ANSI standards as defined in the ESDIS SCF Standards and Guidelines. (portability)	*Inspection*/ FORCHECK, *Infusion*/ `cc -xansi, f77 -ansi, f90 (ansi checking is default)` *Integration*/ `cc -xansi, f77 -ansi`	**Compliance** Testing on this PGE may continue. If this PGE was in Inspection and all the requirements above this one in the table were met, this PGE may begin Infusion testing. **Non-compliance** Testing on this PGE shall be deferred until SDST re-transfers the non-compliant files as compliant files or until all other PGEs have completed testing or are in a similar hold mode; however, until these problems are corrected, this PGE cannot be accepted.
2.9	The delivered documentation shall contain all the elements listed in Section 9.2 for delivered PGEs. (operability)	*Integration*/Visual Inspection	**Compliance** Testing may continue. **Non-compliance** Testing on this PGE shall be deferred until SDST transfers compliant documentation or until all other PGEs have completed testing or are in a similar hold mode; however, until these problems are corrected, this PGE cannot be accepted.
2.10	All compilable PGE files shall link with the SCF SDPTK and compile without errors (the acceptability of warnings shall be decided on a case-by-case basis by the GDAAC Test Lead). (operability)	*Infusion*/ Compilation using makefiles	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE shall stop until SDST resolves SDP S/W-related problems.
2.11	The PGE shall run in the simulated-SCF environment with SDST-supplied test input data to completion without errors and with an exit code of 0. (operability)	*Infusion*/Execution from the command line	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE shall stop until SDST resolves SDP S/W-related problems.

Ref #	Acceptance Criteria (Rationale)	Related SSI&T *Phases*/Test Tool	Next Action
2.12	All output products produced as a result of the PGE being linked to the SCF SDPTK and running in the simulated-SCF environment are the same as the corresponding comparison output files created during TLCF testing within zero percent tolerance. (operability)	*Infusion*/hdiff	**Compliance** Testing on this PGE may continue. If all of the requirements above this one in the table are met, this PGE may now be delivered. **Non-compliance** Testing on this PGE shall stop until SDST resolves SDP S/W-related problems.
2.13	All compilable PGE files shall link with the DAAC SDPTK and compile without errors (the acceptability of warnings shall be decided on a case-by-case basis by the GDAAC Test Lead). (operability)	*Integration*/ Compilation using makefiles	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE shall stop until problems are resolved by the appropriate organization (SDST for SDP S/W-related problems and ECS for DAAC SDPTK-related problems).
2.14	The PGE shall run in the ECS PDPS to completion without errors and with an exit code of 0. (operability)	*Integration*/ Execution within PDPS (see Section 4.3.5 for details) *Acceptance Testing*/ Execution within PDPS	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE stops until SDST resolves SDP S/W-related problems.
2.15	All output products produced as a result of the PGE being linked to the DAAC SDPTK and running in the ECS PDPS are the same as the corresponding comparison output files created during Integration, if available, or TLCF testing, if Integration test results are not available, within zero percent tolerance. (operability)	*Integration*/hdiff *Acceptance Testing*/hdiff	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE stops until SDST resolves SDP S/W-related problems.

Table 5-3. Requirements for Full Acceptance for a PGE

Ref #	Acceptance Criteria [Rationale]	Related SSI&T *Phases*/Test Tool	Next Action
3.1	The PGE runs successfully within the PDPS without crashing, produces an exit code of 0, and produces output data that matches comparison output files generated during Acceptance Testing within zero percent using input files generated by the PGEs on which it depends. (This does not apply to the L1A PGEwhen testing with input data sets that do not contain errors.) [operability]	*Acceptance Testing*/ Execution within PDPS	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE stops until SDST resolves SDP S/W -related problems.
3.2	The PGE produces appropriate error messages that match the documented error messages under error conditions and produces an exit code of 1 (see "GDAAC Test Plan" for definition of error conditions). [reliability]	*Acceptance Testing*/ Error testing	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE stops until SDST resolves SDP S/W -related problems.
3.3	The PGE runs as documented under boundary conditions (see "GDAAC Test Plan" for definition of boundary conditions). [reliability]	*Integration*/hdiff *Acceptance Testing*/ Boundary testing	**Compliance** Testing on this PGE may continue. **Non-compliance** Testing on this PGE stops until SDST resolves SDP S/W -related problems.

Table 5-4 contains a summary of the acceptance criteria that must be met in order to move a PGE from one phase of testing to the next.

Table 5-4. Phase Change Acceptance Criteria

From This Phase...	...These Acceptance Criteria Must Be Met...	...To Move to This Phase
Transfer Package Inspection	1.1 1.2 1.3 1.4	PGE-specific Inspection
PGE-specific Inspection	2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 (if applicable)	Infusion
Infusion (for one PGE from each available discipline)	2.8 (if applicable) 2.9 2.10 2.11 2.12 2.13 2.14 2.15	Integration

Table 5-5 lists the acceptance criteria that must be met by a PGE in order to achieve Conditional Acceptance and Full Acceptance.

Table 5-5. Acceptance Criteria

Acceptance Level	Criteria		
Qualified	1.1 1.2 1.3 2.1 2.2 2.3	2.4 2.5 2.6 2.7 2.8 2.9	2.10 2.11 2.12 2.13 2.14 2.15
Full	3.1	3.2	3.3

Table 5-6 explains the different states a PGE can be in during SSI&T. These states are achieved as a result of the activities described in Section 4 being performed and of the criteria in this section being met. All states except Transferred correspond directly to the ClearCase labels that files have after they are delivered. (Transferred is excepted because CM is under SDST control until Delivery.) Figure 5-1 shows the conditions for promoting a PGE to these states through a state transition diagram.

Table 5-6. States of a PGE

PGE State	Entry Criteria	Exit Criteria
Transferred	The Transfer phase is complete for the Transfer Package that contains this PGE.	The delivery review is accepted by GDAAC for the Transfer Package that contains this PGE **OR** a problem report has been opened for this PGE.
Delivered	The delivery review is accepted by GDAAC for the Transfer Package that contains this PGE.	All Conditional Acceptance criteria have been met for this delivered PGE **OR** a problem report has been opened for this PGE.
Conditionally Accepted	All Conditional Acceptance criteria have been met for this delivered PGE.	All full acceptance criteria have been met for this conditionally accepted PGE **OR** a problem report has been opened for this PGE.
Fully Accepted	All full acceptance criteria have been met for this conditionally accepted PGE.	A problem report has been opened for this PGE (from tests performed during the post-SSI&T phase of Stress Testing).
Regression	A problem report has been opened for a PGE.	All tests run previously on this PGE have been passed. The state returns to the state the PGE was in when Regression Testing began.

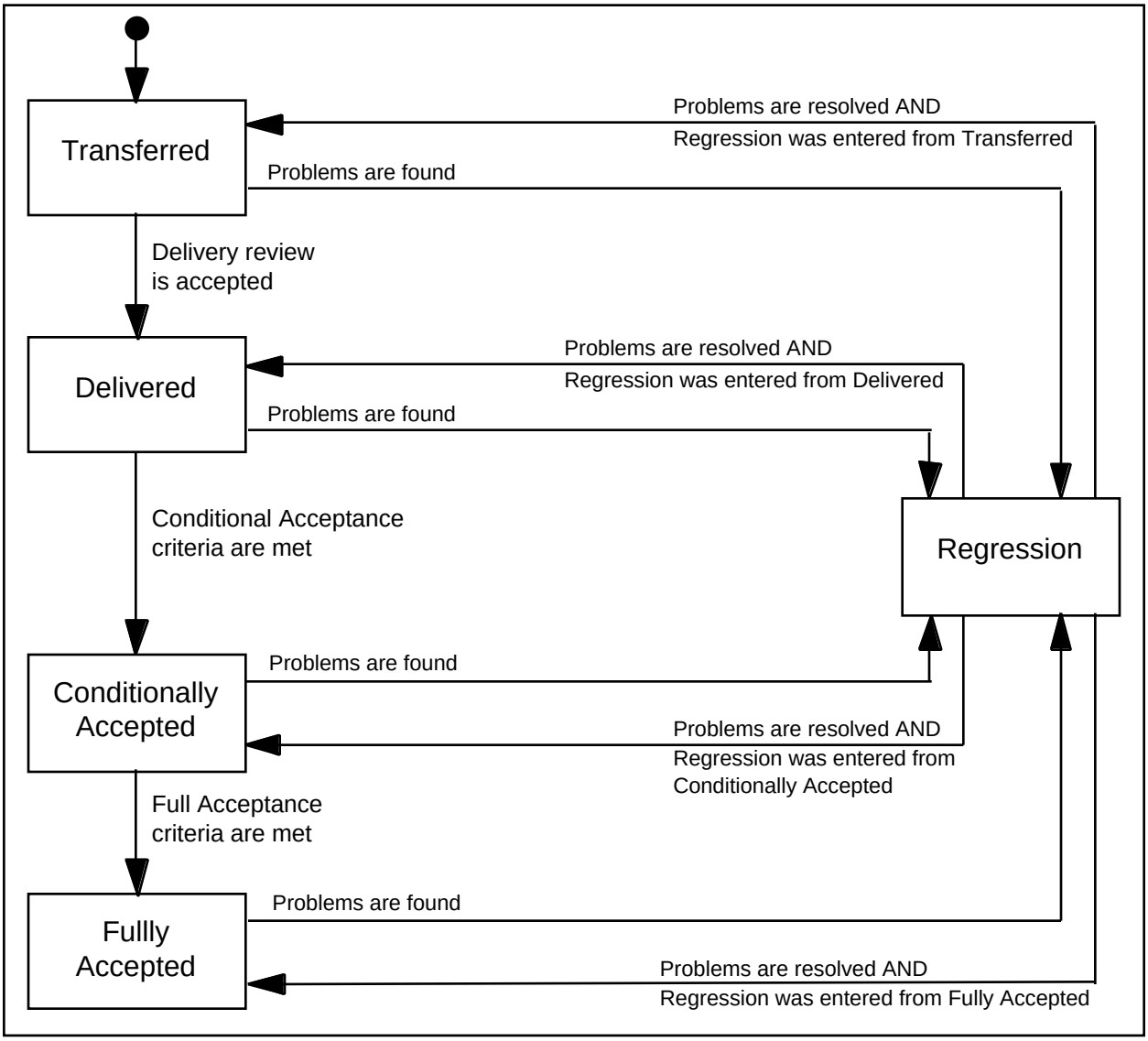

Figure 5-1. State Transition Diagram

6. TEST ENVIRONMENT

The test environment is the ECS. V1 SSI&T will be sharing the resources of ECS with Tropical Rainfall Monitoring Mission (TRMM) data testing. The impact of this resource sharing is TBD; when the ECS and TRMM schedules are firmer, the GDAAC Systems Engineer will analyze this impact and this document shall be updated.

6.1 Software Tools

The tools shown in Table 6-1 are part of the ECS delivery and will be used during SSI&T.

6.2 Hardware

The following hardware element will be dedicated to the MODIS V1 SSI&T:

- SPRHW-GSFC-1Power Challenge XL- all components including all RAID arrays will be required.

The following items may be shared with GDAAC personnel:

- SPRHW-GSFC-2 X-terminal.
- SPRHW-GSFC-3 X-terminal.

The details of the above hardware items are presented in "Release B GSFC DAAC Design Specification for the ECS Project," 305-CD-030-002.

The GSFC DAAC will provide all hardware and software resources required to accomplish the MODIS Team's integration and testing of MODIS V1 software in March through November 1997.

The currently maximum resources available are:

- Total disk space available: 154 GB (RAID) for the science processor, SGI PC XL
- Total memory available: 2 GB RAM for the science processor, SGI PC XL
- Minimum memory expected to be available for exclusive MODIS use in GBs will be as much as possible and determined by the GDAAC at a later date.
- MODIS will be sharing Release A of ECS at the GDAAC with TRMM Science Data and Information System and EOS Ground System testing. Projected times and resources available for shared MODIS testing has not yet been determined. Shared testing will occur from March through November 1997.

Table 6-1. SSI&T Tools

Tool	Phase	Version
Adobe Acrobat	All	TBS
C Compiler	Infusion, Integration, Acceptance Testing	SGI 6.2
ClearCase	All	2.1
DDTs	Problem Reporting	3.1.12
Emacs	All	TBS
EOSView	Infusion, Integration, Acceptance Testing, Regression Testing	Release A
FORCHECK	Inspection, Regression Testing	TBS
FORTRAN Compiler	Infusion, Integration, Acceptance Testing	SGI 6.2
Fortran 90 Compiler	Infusion, Integration, Acceptance Testing	SGI 6.2
HDF	Infusion, Integration, Acceptance Testing	4.0.1.p1
hdiff	Infusion, Integration, Acceptance Testing, Regression Testing	TBS
IDL	Infusion, Integration, Acceptance Testing, Regression Testing	TBS
MS Excel	All	4.0a
MS Power Point	All	3.0
MS Word	All	2.0c
Netscape	All	2.0
PCF Checker	Inspection, Regression Testing	5.1
Prohibited Function Checker	Inspection, Regression Testing	Release A
Prolog Extractor	Inspection	Release A
RCS	All	IRIX 6.2
SSIT Manager GUI	Inspection, Infusion, Integration, Acceptance Testing, Regression Testing	Release A
Wabi	All	1.0
Xedit	All	TBS
Operating System	**Phase**	**Version**
IRIX	All	6.2
Solaris	All	2.4
Sun OS	All	4.1.4

7. MANAGEMENT ISSUES

7.1 Configuration Management

During SSI&T, CM is controlled by SDST and GDAAC. SDST controls CM during SSI&T through Infusion; at Delivery SDST turns CM over to the GDAAC.

The GDAAC-controlled CM receives files from the TLCF but does not return any files to it. Software fixes are never made on files within the GDAAC-controlled CM facility – files that are modified and delivered to the GDAAC-controlled CM replace previous versions.

7.1.1 SDST-Controlled Configuration Management

SDST shall use ClearCase to control CM of transferred files at the GDAAC in ECS from installation until they are delivered.

7.1.2 GDAAC-Controlled Configuration Management

When a delivery is made, CM is turned over to GDAAC. For files outside of the data server, GDAAC shall use ClearCase to manage ASCII files and shall use a combination of UNIX permissions and access control to manage binary files.

Although the GDAAC controls the CM of delivered files, GDAAC shall not make any modifications to the files other than updates to files re-transferred from SDST or modifications formally directed by SDST via e-mail. GDAAC-generated requests to modify delivered files shall be initiated through a DDTs report.

Details of GDAAC-controlled CM and version numbering can be found in the “GDAAC EOS AM-1 CM Plan.” This plan shall also address the CM of executables during Integration and Acceptance Testing, with particular attention to when executables, Science Software Execution Packages (SSEPs), and output data files may/must be deleted in order to make room for new files.

7.2 Use of Performance Statistics

V1 SSI&T will produce performance statistics on the MODIS V1 SDP S/W . The performance statistics to be measured are listed in Section 4.3.7. Also, testers will record the sizes of the output data files. Because this software is not the at-launch version, and it is not running on the target operational platform, the use and distribution of these statistics is sensitive.

All statistics shall be reported to SDST at the completion of SSI&T. The final statistics shall also be made available to the following groups:

- ECS Science Office.
- ECS modeling team, along with any SDST projections as to differences between these statistics and V2 statistics.
- MODIS scientists.

Pending approval by SDST, the statistics shall also be made available to the scientific community through the public-access EOS AM-1 DST WWW page (URL: http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/EOSAM/am_main.html).

7.3 Demonstrations

During Beta SSI&T, it was useful to demonstrate the SSI&T process, the SSI&T tools, Interim release 1 (Ir1) ECS and the MODIS Beta SDP S/W to various interested groups. The benefit of these demonstrations was that scientific programmers and SDST members learned more about the operational environment that they were expected to support.

During V1 SSI&T, demonstrations will be similarly useful. Members of the GDAAC Test Team shall demonstrate the revised SSI&T process and the new capabilities of ECS by using various MODIS V1 SDP S/W PGEs. The PGEs used for the demonstrations shall be chosen based on the demonstrator's familiarity with the PGE, not based on the performance of the PGE; therefore, it is possible that a PGE that does not yet meet the acceptance criteria in Section 5 may be demonstrated to show the ability of the SSI&T process to detect problems in the various phases of testing.

7.4 GDAAC Use and Distribution of Science Software

Any requests made to the GDAAC for the MODIS V1 SDP S/W shall be approved by SDST Manager before the SDP S/W is distributed or demonstrated. Requests are expected to come from the ECS Science Office for PGEs to be used in Release B ECS system testing.

8. TRAINING

There is no assumption of formal training for SSI&T. MODIS V1 SDP S/W contains many new and updated PGEs and is significantly different from the Beta version, and the new releases of ECS will have much more functionality than Ir1. Therefore, all schedules will be developed with room for a learning curve.

SDST shall instruct the GDAAC Test Team on the use of the SDP S/W through the “MODIS V1 Installation and Operations Guide” and through hands-on On-the-Job Training (OJT).

ECS Science Office members and members of M&O shall instruct the GDAAC Test Team and the SDST Test Team on the use of ECS through the SSI&T procedures in “The Green Book" and through hands-on OJT.

9. DOCUMENTATION REQUIREMENTS

Various levels of documentation are necessary to carry out the procedures of V1 SSI&T. This section describes the requirements for documentation from both SDST and GDAAC.

9.1 Science Software

The MODIS V1 SDP S/W shall include the following documentation at the time of transfer:

- One README ASCII file per PGE that follows the example in Appendix D.
- Test documentation for each PGE containing descriptions of test procedures run on the PGE at the TLCF, compilation logs and test results obtained at the TLCF, and a brief analysis of the testing at the TLCF (see Appendix G).
- One README ASCII file per non-PGE directory, as needed, for such things as run-time libraries and testing utilities.

The MODIS V1 SDP S/W shall include the documentation listed above and, for each PGE tested during Infusion, the following documentation at the time of delivery:

- Test documentation for each PGE containing descriptions of test procedures along with test compilation output, test results, and brief test analyses for all tests run on the PGE during Infusion.
- Compilation logs and test results obtained during Infusion.
- A brief analysis of the testing during Infusion (see Appendix G).

The delivery shall not be accepted without appropriate test documentation as described above.

Any PGEs re-transferred to GDAAC (due to fixes for problems found during SSI&T or problems found at the TLCF) shall include the following documentation:

- The DDTs reference number for the original problem being fixed.
- A brief description of the fix that was performed.
- A list of which files were affected and are being transferred, created the same way as the master packing list (described in acceptance criterion 1.2).
- Test procedures, test compilation output, test results, and brief test analyses from the TLCF for the fixed software.

- Any new instructions for using the modified software or notice that the original instructions still apply.
- Descriptions of any PGEs, products, or files that are affected by this fix and how they are affected.

9.2 MODIS System-Level

Drafts of the following documents shall be provided to the GDAAC at least one month before the first Transfer:

- MODIS V1 Installation and Operations Guide (content description below).
- MODIS V1 System I&T Test Plan (content description below).
- MODIS V1 System Description Document (content description below).

The baselined versions of the following documents shall be transferred to the GDAAC in both hard- and soft-copy along with the first Transfer Package:

- A packing list created as described in acceptance criterion 1.2.
- MODIS V1 System Description Document

  This document describes the structure and high-level workings of the SDP S/W system. This document should serve as a basic reference, pointing to the more detailed information provided in the other documents such as an Algorithm Theoretical Basis Document (ATBD).

  It shall include the following:

  - Introduction - A one-page executive summary of the material
  - Background - Describes the reason the SDP S/W was developed and the design approach. Reference any other documents to assist the reader (e.g., ATBDs).
  - System Concepts - Describes the functional design of the SDP S/W system, including methodology (i.e., structured or object-oriented), the processing paradigms employed (e.g., sequential, concurrent), the granularity of the input data and frequency of processing, and the data granularity of the processing.
  - System Structure - An overview of how the SDP S/W system is organized in terms of an object model or subordinate subsystems. Also, describes the context, extent of use, and origin of any heritage code or Commercial Off-The-Shelf (COTS) that are used. Includes a simple diagram to illustrate the description and PGE-level dependency chart.
  - Processing Components - The major components or subsystems that comprise this SDP S/W and how they relate to the PGEs are described briefly.

- Data Flow - Describes the flow of data through the SDP S/W system at a high level.
- Operational Scenario(s) - Describes broadly the conditions under which the various PGEs are executed.
- Environment - Lists the computational, communications, and human resources requirements needed to run the SDP S/W effectively and efficiently. Includes programming and script languages employed.
- Interfaces - Describes any needed access or interface with other SDP S/W systems, ECS components (e.g., the data server), ancillary data, or QA.
- System Documentation - References other documents related to this system and where they can be obtained.
- SDP S/W Outputs - Brief descriptions of the various temporary, intermediate, or product outputs.
- Product Output 1 - Describes the generation and purpose or use of this item. Includes product dependencies and metadata associated with this product output. Refers to “MODIS V 1 Processing Files Description Document” for file format details.
  - Scientific Basis - A very brief description of the scientific aspects, referring to other documents (e.g., ATBDs) for more detailed information.
  - Inputs - Describes the primary data input files used in generating this product.
  - Quality Assurance - Describes at an overview level how the product’s integrity is maintained and the conditions under which automated in-line QA, manual inspection at GDAAC, and/or manual inspection by SDST are performed. The specific GDAAC and SDST QA procedures should be delineated in the “MODIS V1 Installation and Operations Guide.”
- Product Output N - Same as Product Output 1 for as many output products as are produced by the V1 SDP S/W .
- PGEs - Identify and describe the PGEs.
- PGE1 - A description of the processing performed by this PGE and key implementation decisions.
  - Purpose - What does execution of this PGE accomplish?
  - Structure - Describes the processing steps and binary executables which comprise this PGE.
  - Data Files - Provides a tabular list of the input, output, and temporary files. Includes the run-time logical identifiers, source (if input) and brief description.
  - Activation Rules
  - What are the conditions under which this PGE is executed?
- PGEN - Same as PGE1 for as many PGEs are included in the V1 SDP S/W system.

- System Performance - Describes nominal performance measures for each PGE.
- Performance Factors - What criteria are appropriate to check that a PGE is performing nominally?
- Resource Utilization - Lists TLCF values for disk, memory, CPU, and computer type/class.
- Processing Time - Nominal ranges for CPU and wall clock.
- Memory Requirements - Describes direct access storage and shared memory requirements.
- Appendix Change History - Structural changes are listed here in tabular form with the date, version number and a brief explanation given for the change.

· MODIS V1 Installation and Operations Guide.

This document shall instruct the GDAAC testers on how to install and use the MODIS V1 SDP S/W. It shall include the following information:

— Investigator or Team.

— Point(s) of contact (include name, telephone, fax, and e-mail) – for questions regarding only the Transfer Package.

— Purpose of the Transfer Package.

— Delivery context diagram(s)

— Description of problems(s) resolved, if any – list problem reports resolved with this Transfer Package (including DDTs number) and method of resolution.

— Copies of any waivers from ESDIS along with explanations of how these waivers affect the SDP S/W .

— List of Transfer Package contents (see Section 4.3.2), including the following information for each PGE:

1. Name and function performed.
2. PGE identifier.
3. PGE components and developer-assigned version numbers.
4. Point of contact (for technical questions specific to this PGE).
5. SCF test site configuration (need only be provided once if applies to all delivered source code) – hardware; operating system and version number; memory; software libraries, tools, and version numbers (e.g., IMSL, etc.).
6. Compilation information – source code compiled information and listing from the relevant manual pages describing the compiler options used.
7. Listings of the first few records of binary coefficient files.

8. List of references to associated documentation – each document referenced must either be included with the delivery, or information needs to be provided detailing how to obtain the document.
9. Summary of files associated with this PGE – for each file utilized by this PGE, list: name, format (e.g., ASCII, postscript, etc.), type (e.g., C source code, makefile, test data, defect list, etc.), version number, file size in bytes, and short text description.
10. Estimate of resources required for execution.
11. List of processing dependencies – ancillary data and pre-processing.
12. List of known defects.

— A summary of impacts or changes to the operations (e.g., resource requirements, procedures, interfaces).

— Routine procedures – describes those procedures that need to be performed on a regular basis. Include screen layouts, menu selections, and command language as appropriate.

— Configuration management – defines which CM tool will be used during Inspection and Infusion. Describes SDST CM policies at GDAAC during Inspection and Infusion. Identifies any unique issues related to CM of source code, coefficient files, test data, test plans, and test outputs. Suggests levels of change control for the various elements.

— Installation – identifies instructions, procedures and/or scripts to be used for build/install of SDP S/W and any COTS, as well as setup/configuration. Includes any libraries and a list or pointer to a list which gives all files, current version number and size (bytes).

— Intermediate file backup procedures – delineates frequency of backup of any intermediate files that are used for processing subsequent data.

— Reactive maintenance – those procedures that are expected to be performed in reaction to operational problems are described for V1 SSI&T rehearsal.

— Restart instructions – delineates the steps that need to be performed to restart the PGE or the entire SDP S/W following a PGE crash, a PDPS crash, and a system crash. Includes actions involving temporary files, intermediate files, and log files.

— Shutdown Instructions – what steps are required to shut the SDP S/W down gracefully? How should the SDP S/W be shut down in a hurry?

— Supplied troubleshooting tools – lists and describes any tools that have been supplied to aid in troubleshooting.

— Error handling procedures – lists any normal anticipated errors and how to correct them. Includes a table of ALL possible error codes, what each means, and what action to perform. Lists all log files and what information can be found

in each. Each log entry type needs to be documented, along with a description of each field and what it can contain.

· Registration Information

The following information must be provided for each PGE in order to correctly populate the PGE Object Design Language (ODL) File required to register a PGE in the PDPS:

— PGE name – must be a string, maximum length is twelve characters.

— PGE version – must be a string, maximum length is five characters.

— Nominal time interval between start of PGE runs – must contain a single P=V string, where P is one of { MONTHS, WEEKS, DAYS, HOURS, MINS, SECS }

Example: PROCESSING_PERIOD = “DAYS=1”

— Nominal time boundary on which PGE processing begins – must contain one of { START_OF_HOUR, START_OF_6HOUR, START_OF_DAY, START_OF_WEEK, START_OF_MONTH }

also, “+” or “-” may be added to any of these, where “+/-” specifies integer seconds

Example: PROCESSING_BOUNDARY = “START_OF_HOUR”

— Exit codes for this PGE – must be integers and be 0 or between 200 and 239.

— Message corresponding to each exit code – must be a string, maximum length is 240 characters.

— Name of PGE upon which this PGE depends – must be a string, maximum length is twelve characters. (PGE cannot depend on itself)

Example: This CERES PGE depends on the exit code of a MODIS PGE: execute the CERES PGE only if the MODIS PGE has exit code = 0 DEPENDENCY_PGE_NAME = “MODIS”

— Operator for exit code dependency condition – must be one of { >, <, >=, <=, =, != }.

Example: EXIT_OPERATION = “=“

— Exit code for PGE upon which this PGE depends – must be an integer and be 0 or between 200 and 239.

Example: EXIT_CODE = 0

- For all input files: name of metadata parameter within ESDT format input file on which this PGE depends – must be a string, maximum length is 40 characters; and must be present in the ESDT ODL file for this ESDT.

- Operator for Q/A dependency condition – must be one of { >, <, >=, <=, ==, != }

- Q/A value for ESDT upon which this PGE depends – computer data type (string, float, or long) of the value must correspond to the computer data type given in the ESDT ODL file.

· MODIS V1 System I&T Test Plan

This document shall explain the test plan for SDP S/W testing at the TLCF. This document shall also include an explanation of expected exit codes for each PGE and a description of PGE product dependencies.

· MODIS V1 Test Descriptions

This document shall give details about the test procedures used during testing at the TLCF and test results.

· MODIS V1 Processing Files Description

- Introduction – the version of SDP S/W for which this document applies needs to be stated here, along with an overview of the document organization. This introduction also provides a brief overview of the SDP S/W and the reader is directed to the System Description Document (SDD) for a description of the SDP S/W . A high-level data flow diagram is included.
- Data Sets - external (i.e., produced by someone else) – provides a list of the external input or ancillary data sets and briefly describes their functions within the system.
  - Data Set Description – lists and describes the data sets. This description will be at a level to contain the organization and physical and logical record lengths.
    - Data Set 1 – each data set's attributes will be described in a consistently followed format. The file header information and data record descriptions will have each byte defined. Scaling factors and units shall be indicated.

      If this is a HDF file, the data model and attribute records are described instead.
    - Data Set N – follow the guidelines from Data Set 1 until all external data sets have been described.
- Data Sets - internal (i.e., produced by this SDP S/W) – follow the outline for Data Set - External. This would include temporary files, intermediate files, and output files. If UNIX pipes are used in a PGE, delineate the information contained in each standard output record format.

  If there are no internal data sets, include the section but write: NONE.

- MODIS V1 Data Product Catalog
- PGE activation rules (may be included in the SDD)

The documents above shall be updated and included in the delivery to the GDAAC in both hard- and soft-copy along with the SDP S/W.

9.3 Goddard DAAC

The GDAAC shall provide the following documents to SDST during the Preparation phase two months before the first Transfer:

- GDAAC V1 Test Plan

  This document shall define the test plan for V1 SSI&T.

- GDAAC V1 Test Procedures

  This document shall provide step-by-step instructions for V1 SSI&T during the Inspection, Integration, Acceptance Testing, Problem Resolution, and Regression Testing phases.

- GDAAC V1 SSI&T CM Procedures and GDAAC EOS AM-1 CM Plan

  These documents shall provide policies and procedures for GDAAC-controlled CM during SSI&T, including a version-numbering scheme. These documents shall be provided to SDST along with the e-mail in Step 5 of the Preparation phase.

The GDAAC shall create the following documentation during V1 SSI&T:

- Testing log files - Each test procedure shall have a log file associated with it in which the tester shall record all events and anomalies that occur during testing. These files shall be used for later analysis of the test results, for understanding and recording the events in testing, and for writing the test report.
- Test results - Various types of test result files shall be created and stored. These files are described in detail in the “GDAAC V1 Test Procedures.”
- Status charts - Charts showing the testing and acceptance status of each PGE shall be maintained.

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APPENDIX A: ACRONYMS AND ABBREVIATIONS

ATBD	Algorithm Theoretical Basis Document
CM	Configuration Management
CMO	Configuration Management Officer
COTS	Commercial Off-The-Shelf
CSMS	Communication and System Management Segment
DAAC	Distributed Active Archive Center
DAP	Delivered Algorithm Package
DDTs	Distributed Defect Tracking system
ECS	EOSDIS Core System
EDHS	ECS Data Handling System
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Science Data and Information System
ESDT	Earth Science Data Type
FLOP	Floating Point Operation
GDAAC	GSFC Distributed Active Archive Center
GSFC	Goddard Space Flight Center
Ir1	Interim release 1
L1A	Level 1A Software
L1B	Level 1B Software
M&O	Maintenance and Operations
MCF	Metadata Configuration File
MODIS	Moderate Resolution Imaging Spectroradiometer
ODL	Object Design Language
OJT	On-the-Job-Training
PCF	Process Control File
PDPS	Planning and Data Processing System
PGE	Product Generation Executive
SCF	Science Computing Facility
SDD	System Description Document
SDPS	Science Data Processing Segment
SDP S/W	Science Data Processing Software
SDPTK	Science Data Processing Toolkit

SDST	Science Data Support Team
SMF	Status Message File
SSAP	Science Software Algorithm Package
SSEP	Science Software Execution Package
SSI&T	Science Software Integration and Test
TLCF	Team Leader Computing Facility
URL	Universal Resource Locator
TRMM	Tropical Rainfall Monitoring Mission
V1	Version 1
V2	Version 2
VOB	Versioned Object Base
WWW	World Wide Web

APPENDIX B: PROHIBITED FUNCTIONS

This appendix lists the prohibited functions that must not be present in SDP S/W source code or scripts. Prohibited functions are allowed within comments but are discouraged. These tables include all functions prohibited by ESDIS Standards.

Table B-1. C Language Prohibited Functions

Prohibited Functions	Prohibited Functions	Prohibited Functions
Any use of file stream stdin	getegid()	puts()
Any use of file stream stdout	getgrgid()	readdir()
Any use of file stream stderr	getchar()	remove()
abort()	getcwd()	read()
access()	getegid()	rename()
alarm()	geteuid()	rewind()
atexit()	getgid()	rewinddir()
cfgetispeed()	getgrgid()	rmdir()
cfgetospeed()	getgrnam()	scanf()
cfsetispeed()	getgroups()	setbuf()
cfsetospeed()	getlogin()	setgid()
chdir()	getpgrp()	setlocale()
chmod()	getpid()	setpgid()
chown()	getppid()	setsid()
clearerr()	getpwnam()	setuid()
close()	getpwuid()	sig...()
closedir()	gets()	sleep()
creat()	getuid()	stat()
ctermid()	isatty()	system()
dup()	kill()	tc...()
dup2()	link()	tmpfile()
exec()	localeconv()	ttynam()
_exit()	lseek()	umask()
fclose()	mkdir()	uname()
fileno()	mkfifo()	unlink()

Prohibited Functions	Prohibited Functions	Prohibited Functions
fopen()	open()	utime()
fork()	opendir()	vprintf()
fpathconf()	pathconf()	wait()
freopen()	pause()	waitpid()
fstat()	pipe()	write()
fcntl()	printf()	
fdopen()	putchar()	

(Source: URL: http://ecsinfo.hitc.com/iteams/ProhibFunc/ProhibFunc.html, revision 9/4/96)

Table B-2. FORTRAN 77 Language Prohibited Functions

Prohibited Functions	Prohibited Functions	Prohibited Functions
Any use of output to unit 6 or *	PXFFSTAT()	PXFREAD()
Any use of input from unit 5 or *	PXFGETCWD()	PXFREADDIR()
CLOSE()	PXFGETEGID()	PXFRENAME()
OPEN()	PXFGETEUID()	PXFREWINDDIR()
PRINT * ...	PXFGETGID()	PXFRMDIR()
PXFACCESS()	PXFGETGRNAM()	PXFSETGID()
PXFALARM()	PXFGETGROUPS()	PXFSETPGID()
PXFCFGETISPEED()	PXFGETLOGIN()	PXFSETSID()
PXFCFGETOSPEED()	PXFGETPGRP()	PXFSETUID()
PXFCFSETISPEED()	PXFGETPID()	PXFSIG...()
PXFCFSETOSPEED()	PXFGETPPID()	PXFSLEEP()
PXFCHDIR()	PXFGETPWNAM()	PXFSTAT()
PXFCHMOD()	PXFGETPWUID()	PXFTC...()
PXFCHOWN()	PXFGETUID()	PXFTTYNAME()
PXFCLOSE()	PXFGRGID()	PXFUMASK()
PXFCLOSEDIR()	PXFIS...()	PXFUNAME()
PXFCREAT()	PXFISATTY()	PXFUNLINK()

Prohibited Functions	Prohibited Functions	Prohibited Functions
PXFCTERMID()	PXFKILL()	PXFUTIME()
PXFDUP()	PXFLINK()	PXFWAIT()
PXFDUP2()	PXFLSEEK()	PXFWAITPID()
PXFEXEC...()	PXFMKDIR()	PXFWRITE()
PXFEXIT()	PXFMKFIFO()	READ * ...
PXFFASTEXIT()	PXFOPEN()	READ(*,...)
PXFFCNTL()	PXFOPENDIR()	READ(5,...)
PXFFDOPEN()	PXFPATHCONF()	WRITE(*,...)
PXFFILENO()	PXFPAUSE()	WRITE(6,...)
PXFFORK()	PXFPIPE()	
PXFFPATHCONF()	PXFPOSIXIO()	

(Source: URL: http://ecsinfo.hitc.com/iteams/ProhibFunc/ProhibFunc.html, revision 9/4/96)

Table B-3. Fortran 90 Language Prohibited Functions

Prohibited Functions	Prohibited Functions	Prohibited Functions
Any use of output to unit 6 or *	PRINT * ...	WRITE(6,...)
Any use of input from unit 5 or *	READ(*,...)	WRITE(*,...)
CLOSE()	READ * ...	
OPEN()	READ(5,...)	

(Source: URL: http://ecsinfo.hitc.com/iteams/ProhibFunc/ProhibFunc.html, revision 9/4/96)

Table B-4. Perl Prohibited Functions

Prohibited Functions	Prohibited Functions	Prohibited Functions
Any use of file handle STDIN	getpgrp()	semop()
Any use of file handle STDOUT	getppid()	send()
Any use of file handle STDERR	getpriority()	setpgrp()
accept()	getpwuid()	setpriority()
alarm()	getsockname()	setsockopt()
bind()	getsockopt()	shmctl()
chdir()	kill()	shmget()
chmod()	link()	shmread()
chown()	listen()	shmwrite()
chroot()	mkdir()	shutdown()
close()	msgctl()	sleep()
closedir()	msgget()	socket()
connect()	msgrcv()	socketpair()
dbmclose()	msgsnd()	symlink()
dbmopen()	open()	syscall()
die()	opendir()	system()
dump()	readdir()	telldir()
exec()	readlink()	umask()
fcntl()	recv()	unlink()
fileno()	rename()	utime()
flock()	rewinddir()	wait()
fork()	rmdir()	waitpid()
getgrgid()	seekdir()	warn()
getlogin()	semctl()	
getpeername()	semget()	

(Source: URL: http://ecsinfo.hitc.com/iteams/ProhibFunc/ProhibFunc.html, revision 9/4/96)

Table B-5. Shell Script Prohibited Functions, Routines, and Utilities

Prohibited Functions		
Any use of standard error (stderr)	kill	rm
Any use of standard input (stderr)	ln	rmdir
Any use of standard output (stderr)	lp, lpr, lpstat	script
at, atq, atrm	mail (or any of its derivatives)	sleep
cd	mkdir	su
chgrp	mv	telnet
chmod	nice	touch
chown	printf	umask
cp	rcp	write
find	read	
ftp	rlogin	

(Source: URL: http://ecsinfo.hitc.com/iteams/ProhibFunc/ProhibFunc.html, revision 9/4/96)

APPENDIX C: BETA LESSONS LEARNED TRACEABILITY MATRIX

Table C-1 lists the lessons learned that were compiled during Beta SSI&T; each lesson that concerns SSI&T at the GDAAC includes a reference to the section within this document where that lesson is used.

Table C-1. Lessons Learned Traceability Matrix for Beta

Lesson	Lesson Learned	Party	Note	Section
1	PCFs need to be checked at the TLCF prior to delivery to the DAAC.	SDST, ECS	Make the PCF checker available to the TLCF and run the PCF checker at the TLCF to capture errors and provide fixes prior to infusion.	N/A (SDST responsibility)
2	The utility directory structure in DID 205 is unwieldy.	ECS, DAAC	Revisit the directory structure in DID 205; solicit input from Instrument Teams .	A new directory structure has been agreed to by both SDST and GDAAC; it is in Appendix I
3	DID 205 directories are not exactly right for MODIS at the GSFC DAAC.	DAAC	Include a recommended directory structure, using DID 205 as a guide, in the SSI&T MOU.	Appendix I
4	A standard makefile structure would be useful.	SDST	Establish makefile standards/guidelines to provide uniformity across PGEs.	Appendix H
5	Office automation is required at the DAAC and preferably on the test workstation.	ECS, DAAC	Enhance Wabi so it is usable or provide a personal computer with OA tools with future installations.	N/A (ECS responsibility)
6	Check source code files for prohibited functions at the TLCF.	ECS, SDST	A copy of the prohibited function checker and a list of prohibited functions should be provided to the TLCF.	Acceptance criterion 2.1
7	People working with ClearCase during SSI&T need more ClearCase training.	SDST, ECS, DAAC	All personnel working on SSI&T should receive some ClearCase training, other than OJT, prior to the commencement of SSI&T.	N/A
8	SDST should use the template PCF provided with the SDPTK.	SDST	Add items as required to the template; do not remove items from the template as they may be necessary for execution with the DAAC version of the toolkit.	Acceptance criterion 2.5

Lesson	Lesson Learned	Party	Note	Section
9	Deliver one PCF per production PGE.	SDST, ECS	Some PGEs were associated with multiple PCFs. Additional information on PGE design would be useful for Instrment Teams. http://ecsinfo.hitc.com/iteams/pge_wp.html	Acceptance criterion 2.4
10	SDPTK distribution should be consistent and up-to-date for all SCFs and DAACs.	ECS, DAAC	ECS should distribute patches and updates for the SDPTK to the TLCF as they are released.	N/A (ECS responsibility)
11	Relative path names restrict portability of science software and supporting files.	SDST	Deliver source code, PCFs, scripts, makefiles and other files with full path names.	Appendix H
12	Multiple, custom log files can not be used in the production environment.	SDST	This issue goes away as there will be PGE-specific logs in Release A.	N/A
13	Use of custom sections of source code that contain prohibited functions are trapped but are difficult to trace (ifdef).	ECS, ESDIS, DAAC	Prohibited functions should be removed from code prior to delivery.	N/A (ECS responsibility)
14	Timing and method of delivery of science software must be clearly stated and understood.	SDST, DAAC	Analyze this issue and address it in the SSI&T MOU.	4
15	CM policies must be established before software is delivered.	DAAC	Create CM plan for science software at the DAAC. Provide SDST with copy of CM Plan prior to delivery (ASAP).	7, 9.3
16	Consider putting PGEs into CM when testing is complete and successful.	DAAC	Files in ClearCase may cause permission problems. DSS in Release A may supersede this lesson.	7.1.1
17	The Operations Manual needs to be modified during Infusion based on the delivery environment.	SDST, DAAC	Plan time in the schedule for further Operations Manual development during Infusion based on results from initial I&T.	9.2
18	SSI&T MOU was outdated at delivery.	SDST, DAAC	Update the SSI&T MOU as needed up to delivery.	1.3
19	Packing lists must be designed for automated checking.	SDST	Use UNIX 'ls -laR' to create the packing lists.	Acceptance criterion 1.2
20	PGE must be self-contained.	SDST	Environment variables (e.g., $PGS_PC_INFO_FILE) that exist outside the PGE cannot be modified by the PGE.	Acceptance criterion 2.5

Lesson	Lesson Learned	Party	Note	Section
21	Make use of all available documentation.	SDST, DAAC, ECS	Obtain early access to the Green Book (eventually, DID 611) for SSI&T procedures. Make DID 611 and related documents available to TLCF and DAAC prior to delivery. The earlier the better.	N/A (ECS responsibility)
22	A policy for file disposal during testing must be created.	SDST, DAAC	Analyze this issue and address it in the infusion test procedures document and SSI&T MOU. Test results obtained during infusion need to be captured and forwarded to DAAC for post-hand-off testing.	7.1.2, 9.2
23	Disposition of executables built during testing must be clearly specified in test plan or procedures.	SDST, DAAC	Test procedures should state disposition of executables from previous builds, including executables built with various versions of the SDPTK.	7.1.2
24	Status of files accessed during PGE execution must be clearly understood.	SDST, DAAC	In PGE design, if FORTRAN open status 'new' is used, disposition of output files from previous run must be considered. DSS in Release A may supersede this lesson.	MODIS V1 Test Descriptions, GDAAC EOS AM-1 CM Plan
25	Documentation included in the delivery (READMEs, etc.) needs independent review prior to delivery.	SDST	The documentation needs to be checked prior to delivery.	9.2
26	Do not include unnecessary files with the delivery.	SDST	Perform a final check — looking for empty files, CM files (RCS, etc.), object files, etc. — on the file system before it is delivered.	Acceptance criterion 1.3
27	The prohibited function checker is site configurable.	DAAC	Put prohibited function definitions in DAAC CM plan or SSIT MOU.	Appendix B
28	PCF files can be quite long and the checker should be able to handle them.	ECS	Modify the PCF checker to accommodate large PCFs.	N/A (ECS responsibility)
29	Prologs have to conform to ESDIS standards.	SDST, ESDIS	Suggest that ESDIS include a more explicit template in the standards document.	N/A (ESDIS responsibility)
30	HDF installation to allow for 128 open files.	ECS	Configure the HDF that comes with the SDPTK to allow 128 open files.	N/A (ECS responsibility)
31	Data recovery is slow and unreliable.	ECS	Consider alternate ECS backup/recovery software and procedures for Ir1 and beyond.	N/A (ECS responsibility)

Lesson	Lesson Learned	Party	Note	Section
32	Exit codes must be explicitly defined in the science software for a PGE to run and execute properly in ECS with Autosys.	SDST	Ensure that all PGEs provide complete exit status codes.	Acceptance criterion 2.10 and 2.14
33	Software redeliveries need to be more efficient.	SDST, DAAC	Establish pre-defined (formal) process for problem notification and software redeliveries.	4.3.8
34	Databases may fill up quickly, impacting system performance.	ECS, DAAC	Establish automated cleanout /backup procedures for relevant databases.	N/A (ECS responsibility)
35	All organizations involved in SSIT need to plan support for the entire length of the SSIT period.	SDST, DAAC, ECS	At the end of Beta/Ir1 the focus of the development organizations shifted to Release A/V1.	1.1
36	A good problem tracking system is essential to thoroughly track problems encountered in SSIT.	DAAC, ECS	Make DDTs or equivalent tool available to SSIT staff at DAAC in Release A/V1.	N/A (ECS responsibility)
37	Joint access needed for SSIT problem tracking tool.	ECS, DAAC	Problem Reports generated at DAAC inserted into DDTs at SDST; too many hand-offs and potential for non-critical information changing hands	4.3.8
38	Errors, anomalies, and exceptions encountered during infusion testing should be documented and passed to DAAC SSIT staff.	SDST	As stated in SSIT MOU, test results obtained during Infusion must be provided to DAAC SSIT staff at hand-off.	9.2
39	Perform triage on delivered PGEs to get early feedback on potential problem areas.	DAAC	Some PGEs may need extended time to successfully integrate into ECS. These should be identified early to allow adequate time to complete I&T.	4.3.2
40	Request SDST to troubleshoot compile/link process to completion as required.	DAAC	DAAC focus should be on running/debugging rather compile/link. DAAC execution should focus on fault isolation in production environment (e.g., exit codes, SDPTK anomalies).	4.3.6
41	Uniform README files for all PGEs would simplify integration, test and operations.	SDST, DAAC	DAAC will provide suggestions for README template in preparation for V1.	Appendix D
42	Uniform directory structure across all PGEs reduces integration time and simplifies debugging activities.	SDST, DAAC	(None)	Appendix I

Lesson	Lesson Learned	Party	Note	Section
43	High level of communication among ECS sustaining engineers and DAAC operation staff needed.	ECS, DAAC	As patches are made to ECS Release A, coordination with DAAC Operation staff must improve over Ir1 experience.	N/A (ECS responsibility)
44	DAAC Test Plan and Test Procedures need to be drafted prior to infusion and updated as necessary during infusion.	DAAC	Acceptance criteria and procedures will be included in the V1 MOU.	4.5
45	Develop more robust SSIT model based upon Beta experience.	DAAC, SDST	Refine infusion process and associated procedures (e.g., problem reporting/tracking) to successfully integrate and test all delivered PGEs within window of opportunity.	This document
46	Have SDST order data from ECS at the conclusion of SSIT to test end to end system.	SDST, DAAC	This step provides assurance that product was produced as expected and contains proper data.	4.2.3, Acceptance Testing, Steps 5 and 6
47	ECS must be up and available for an adequate period to successfully perform SSIT and related tests on MODIS PGEs.	ECS, DAAC	Ir1 was taken off-line and reconfigured before all Beta PGEs could be integrated and all tests executed. Future releases of the system must be available continuously to successfully complete SSIT.	N/A (ECS responsibility)

APPENDIX D: README EXAMPLE

What follows is an example README for a PGE. The example shows both the elements and the intent of the items that should be included in the PGE READMEs for V1. This example is based on the recommendations of "Software Developer's Guide to Preparation, Delivery, Integration and Test with ECS" and on Beta SSI&T experiences.

```
PGE01 README
PGE Identifier:      PGE01
PGE Name:       Level 1
PGE Function:   Produces MOD_PR01 (L1A), MOD_PR02 (L1B) and
                MOD_PR03 (Geolocation) data products for MODIS

PGE Components and     MOD_PR01.exe  V1.0
Developer-Assigned     MOD_PR02.exe  V1.3
Version Numbers:       MOD_PR03.exe  V1.0
                       PGE01.plV1.0

Point of Contact:    Laurie Schneider

SCF test site configuration:
     Hardware: SGI Power Challenge XL
     Operating system and version number: IRIX 6.2
     Memory: 32 GB hard disk; XXX MB RAM
     Software libraries, tools and version numbers:
          M-API 2.5 (contact Bob Programmer with questions
                     at 352-0004)
          HDF 4.0v2 (contact ECS with questions)
          SDPTK v5.1(contact ECS with questions)

Size of untarred delivery package:  1546 MB

Compilation information:
     The following is a capture of a nominal compilation of PGE01
     in the SDST test environment. This listing was created by
     using the following command:

     make all -f pge01.mk >& pge01.mk.out
     (contents of pge01.mk.out should be here)

     The following information is captured from IRIX 6.2 man pages
     relating to the following compilation options: -ansiposix,
     -n32
     (contents of man pages should be here)

Binary coefficient file listings:
     MOD_PR02.table1
     (first 3 lines of binary file should be here)

     MOD_PR02.table2
     (first 3 lines of binary file should be here)

     etc.
```

```
List of references to associated documentation:
     Level 1A ATBD                 http://www.atbds.gov/l1a.html
     MOD_PR02.original.delivery.doc $HOME/STORE/PGE01/doc
     PGE01.test.results             $HOME/STORE/PGE01/doc

Summary of files associated with this PGE

     Name:                MOD_PR01_main.c
     Format:              ASCII
     Type:                C source code
     Version #:           1.0
     File size in bytes:  245
     Brief description:   Main    routine;    calls    all    other
subroutines;
                          loops based on number of pixels provided

     Name:                PGE01.mk
     Format:              ASCII
     Type:                Makefile
     Version #:           1.0
     File size in bytes:  36
     Brief description:   Makefile to build all software for PGE01

     Name:                PGE01.pl
     Format:              ASCII
     Type:                Perl script
     Version #:           1.0
     File size in bytes:  206
     Brief description:   Perl script to run all three executables
                          that make up PGE01

     Name:                MOD_PR01_gran1.comp
     Format:              Binary
     Type:                Comparison output data
     Version #:           1.0
     File size in bytes:  104033
     Brief description:   Comparison output file for first granule
                          of test data for MOD_PR01

     etc.  (All files associated with PGE01 - other than common
          files such as M-API files - should be documented here)

Size of expected output files:
     MOD_PR01_gran1.out   154 b
     MOD_PR02_gran1.out   2.36 MB
     (All output files for this PGE should be listed here,
     including temporary and intermediate files)

Estimate of resources required for execution:
     Memory:     Average amount of shared memory used:  (fill in)
                 Maximum memory used: (fill in)

     Processing: Number of block input operations: (fill in)
                 Number of block output operations: (fill in)
                 Number of page faults: (fill in)
                 Number of swaps: (fill in)
```

```
     Time:    PGE CPU Time: 1.03 sec
              Elapsed time: 5.04 sec (averaged from test results)

List of processing dependencies: (fill in)
     Ancillary data: (fill in)
     Pre-processing: (fill in)
     Input data:    MODIS product MOD_PR00    channels 1-24

List of known defects:
     1. When a control-C (interrupt) is sent to the PGE
        while the script is transitioning between MOD_PR02
        and MOD_PR03, the script will stop and a core dump
        will be produced. This is being worked on and a fix
        for this will be provided in the second V1 Transfer
        Package.

     2. When a formatted file (not L0 data) is fed into
        PGE01 as the input to MOD_PR01, incorrect data is
        output. This is a known problem but it will not be
        fixed until the V1 delivery; it is not anticipated
        that this situation will occur very often if ever
        in the V1 SSI&T timeframe. If problems should arise
        due to this bug, please contact Bob Programmer at
        352-0004 or Laurie Schneider at 352-2121.

        No other known defects exist. Please report any
        suspected bugs to SDST using the Problem Reporting
        system documented in the MODIS/Goddard DAAC SSI&T
        Procedures and Agreement, SDST-092.

Instructions for building PGE01:
     1. Change line 5 in pge01.mk to reflect the current
        directory.
     2. (Optional) Type make clean -f pge01.mk
     3. Type make all -f pge01.mk

Instructions for running PGE01:
     1. Type pge01.pl
        This script will execute the internal executables.

Production rules:
     PGE01 should be run whenever 3 continguous granules of
     L0 data are present.

Known differences between this software and at-launch
version:  (fill in)
     This document is produced in accordance with the
     MODIS/GDAAC SSI&T Procedures and Agreement document,
     SDST-092.
-------------------------------------------------------------------------------------------------
```

APPENDIX E: ENVIRONMENT VARIABLES DEFINED IN RELEASE A

The environment variables listed below will be defined in ECS and shall not be modified by the MODIS V1 SDP S/W :

DPATMGR_HOME
DPATMGR_BINDIFF_ENV
LD_LIBRARY_PATH
IDLPATH
PGS_PC_INFO_FILE
XFILESEARCHPATH
DPAT_PGE_SCIENCE_MD
DPAT_ESDT_SCIENCE_MD
PLDB_USER
PLDB_PASS
PLDB_SERV
PLDB_DBASE
LPDEST
DPATMGR_DAT
UIDPATH
EOSVIEWHELPER
FCKCNF
FCKCPR
PATH

APPENDIX F: E-MAIL CHECKLISTS

The following sections provide checklists to ensure that all necessary information is included in the e-mails between GDAAC and SDST in the SSI&T phases. The steps listed in the below sections correspond to the steps in the activity chart.

F.1 Preparation Checklist

The steps listed below correspond to the steps in the Preparation Phase shown in Section 4.3.1.

Step 1: GDAAC assesses the resources projected to be available for Release A and sends an e-mail to SDST with these projections (For first Transfer Package: December 15, 1996)

- ☐ Total disk space available in GBs.
- ☐ Total memory available in GBs.
- ☐ Minimum disk space expected to be available for exclusive MODIS use in GBs.
- ☐ Minimum memory expected to be available for exclusive MODIS use in GBs.
- ☐ Projected times available for exclusive MODIS testing.
- ☐ Projected times available for shared MODIS testing; percentage of resources available during shared MODIS testing.
- ☐ Draft of GDAAC V1 Test Plan
- ☐ Draft of GDAAC V1 Test Procedures
- ☐ Draft of GDAAC EOS AM-1 CM Plan
- ☐ Draft of GDAAC V1 SSI&T CM Procedures

Step 2: (no checklist needed)

Step 3: SDST notifies GDAAC, ECS, and the ESDIS Project of SDST's intention to conduct SSI&T via an Operations Support Request with information regarding the time frame, size and scope of the transfer, and required resources (For first Transfer Package: January 15, 1997)

- ☐ Projected date for the first Transfer.
- ☐ Projected date for the first Delivery.
- ☐ Average anticipated time to bring a single PGE to Delivery.
- ☐ Projected size of Transfer Package 1 in GBs broken out by software and data.

- ☐ Projected minimum memory requirement in GBs.
- ☐ Usage results for all PGEs to be included in the first Transfer Package.
- ☐ Draft of “MODIS V1 Installation and Operations Guide.”
- ☐ Draft of “MODIS V1 System I&T Test Plan.”
- ☐ How many accounts will be needed.

Step 4: GDAAC responds with an assessment/approval of SDST’s stated intentions and requirements and includes specific information about how to make the transfer. Notice should include method of software transfer. (For first Transfer Package: January 22, 1997)

- ☐ If files are being transferred by tape, the tape format that SDST should use.
- ☐ If files are being transferred by ftp, details on where to ftp them.
- ☐ Definition of the computer and directory of the staging area.
- ☐ Account names and which groups each belongs to.
- ☐ A copy of the baselined GDAAC V1 Test Plan.
- ☐ A copy of the baselined GDAAC V1 Test Procedures.
- ☐ A copy of the baselined GDAAC EOS AM-1 CM Plan.
- ☐ A copy of the baselined GDAAC V1 SSI&T CM Procedures.

Step 5: SDST provides confirmation of and/or refinements to the planned delivery schedule to GDAAC (cc: ECS and ESDIS Project) as well as updates on details about the transfer. (For first Transfer Package: January 29, 1997)

- ☐ Directory structure for the first Transfer Package.
- ☐ Details about SDST-controlled CM at GDAAC.
- ☐ PGE Information:
  - — PGE ID.
  - — Baseline estimate of wall clock time for PGE execution.
  - — Number of Floating Point Operations (FLOPs) for PGE execution.
  - — List of input products.
  - — List of output products.
  - — List of temporary, intermediate, or product files; each with name, volume (MB) produced by a single PGE execution, spatial and temporal coverage.

- ☐ File Transfer Templates:
  - — Data transfer ID.
  - — Product ID to be transferred.
  - — Source location.
  - — Destination location.
- ☐ QA Activity Templates (at the same time resolution as PGE):
  - — List of persons and locations involved.
  - — List of products required.
  - — List of QA products generated.
  - — Estimated time from start to finish.
- ☐ Process Activations:
  - — List of processes (PGEs activated, files transferred, QA activities done).
  - — Frequency each process activated.
- ☐ How do descriptions change with time?

Step 6: (no checklist needed)

F.2 Transfer Checklist

The steps listed below correspond to the steps in the Transfer Phase shown in Section 4.3.2.

Step 7: SDST brings SDP S/W to GDAAC.

(For first Transfer Package)

- ☐ Contains only PGEs that will run operationally at the GDAAC and that have completed testing at the TLCF at least two weeks before transfer.
- ☐ Contains only PGEs that will run operationally at the GDAAC and that have completed testing at the TLCF at least two weeks before transfer.
- ☐ Contains L1A, Geolocation, L1B, and Cloud Mask.
- ☐ Contains one master PCF per PGE.
- ☐ Contains MCFs.
- ☐ Contains all supporting simulated data necessary to test the PGEs, including input data and ancillary data.

- ☐ Contains all TLCF test scripts, test compilation logs, output result files, brief test analyses, usage statistics, and supporting test documentation for each PGE.
- ☐ Contains M-API.
- ☐ Contains the MODIS PCF template.
- ☐ Contains a packing list created via `ls -alR`.
- ☐ Contains baselined “MODIS V1 Installation and Operations Guide”.
- ☐ Contains baselined “MODIS V1 System I&T Plan”.
- ☐ Contains baselined “MODIS V1 System Description Document”.
- ☐ Contains baselined “MODIS V1 Test Descriptions”.
- ☐ Contains baselined “MODIS V1 Processing Files Description”.
- ☐ Contains PGE-specific documentation.
- ☐ Contains PGE activation rules.
- ☐ Contains all files in compressed tar files with names following the naming convention in section 4.3.2.

SDST brings SDP S/W to GDAAC (For Subsequent Transfer Packages):

- ☐ Contains PGEs that will run operationally at the GDAAC and that have been tested at the TLCF that were not included in the previous Transfer Packages
- ☐ Contains updated PGEs modified since the first receipt of that PGE based on problems found during DAAC or TLCF testing
- ☐ Contains all supporting simulated data necessary to test the PGEs being included in the Transfer Package, including input data sets and ancillary data
- ☐ Contains all TLCF test scripts, output result files, usage statistics, and supporting documentation for each PGE in the package

Step 8: SDST installs SDP S/W on test environment.

Step 9: SDST puts SDP S/W under SDST-controlled CM.

- ☐ All items under /store are in ClearCase.
- ☐ All items under /run are under CM.

F.3 Inspection Checklist

The steps listed below correspond to the steps in the Inspection Phase shown in Section 4.3.3.

Step 10: GDAAC checks the entire Transfer Package for completeness and accuracy.

- ☐ GDAAC tests acceptance criterion 1.2: packing list is correct.
- ☐ GDAAC tests acceptance criterion 1.3: does not contain extraneous files or directories.
- ☐ GDAAC tests acceptance criterion 1.4: system documentation is complete.

☐ Step 11: GDAAC checks software for presence of prohibited functions.

☐ Step 12: GDAAC checks software for prologs.

☐ Step 13: GDAAC checks for correct file name extensions.

☐ Step 14: GDAAC examines software for mapping of one Process Control File (PCF) per PGE.

☐ Step 15: GDAAC checks PCFs for correct syntax.

☐ Step 16: GDAAC checks PGEs for correct use of environment variables.

☐ Step 17: GDAAC checks makefiles for compliance with agreed-upon standards.

☐ Step 18: GDAAC checks FORTRAN 77 software for ESDIS compliance (successful compilation checks ANSI compliance for C and Fortran 90 programs and occurs in Integration or Acceptance Testing since there is no stand-alone tool installed at the GDAAC to check Fortran 90 or C).

F.4 Infusion Checklist

The steps listed below correspond to the steps in the Infusion Phase shown in Section 4.3.4.

☐ Step 19: SDST builds all PGEs and all utility software and libraries in simulated-SCF test environment using the SCF SDPTK.

☐ Step 20: SDST runs a functional test on each PGE built in Step 1 in the simulated-SCF environment and checks output files for their exact match to comparison output files.

F.5 Delivery Checklist

The steps listed below correspond to the steps in the Delivery Phase shown in Section 4.3.5.

Step 21: SDST presents a delivery review to include:

- ☐ A summary of test results.
- ☐ Special instructions for any PGEs not already demonstrated during Infusion.
- ☐ Summary of any problems already encountered or potential problems.

Step 22: GDAAC Test Lead accepts delivery review or provides recommendations for changes.

Step 23: SDST hands-off the Delivery Package:

- ☐ Updated documents.
- ☐ Infusion testing documentation.

Step 24: GDAAC CMO checks all delivered PGEs into the GDAAC VOB and labels them “delivered.”

F.6 Integration Checklist

The steps listed below correspond to the steps in the Delivery Phase shown in Section 4.3.6.

Step 25: GDAAC and SDST build all PGEs, utility software, and libraries on system using the DAAC SDPTK.

Step 26: GDAAC and SDST register all PGEs (this procedure includes multiple tasks from the Green Book).

Step 27: SDST and GDAAC run functional tests on all PGEs that were tested in Infusion.

F.7 Acceptance Testing Checklist

The steps listed below correspond to the steps in the Delivery Phase shown in Section 4.3.6.

Step 28: GDAAC runs SDST-defined functional tests on delivered PGEs within the ECS PDPS.

Step 29: GDAAC links one or more dependent PGEs within the ECS PDPS.

Step 30: GDAAC runs boundary tests on delivered PGEs within the ECS PDPS.

Step 31: GDAAC runs error tests on delivered PGEs within the ECS PDPS.

APPENDIX G: TEST ANALYSIS EXAMPLES

This appendix contains examples of the brief TLCF and SSI&T analyses required as part of a delivery.

Analysis of a nominal test:

> PGE 2 ran to completion with an exit code of 0. All output product files compared to the comparison files within zero percent.

Analysis of a test that encountered a problem (this example is based on a hypothetical scenario):

> PGE 2 crashed during its functional test at the TLCF and produced a core dump. Investigation showed that it crashed during the third process, MOD_PR36 (DDTs #MODxx10037). The Science Software Transfer Group determined that there was an inadvertent divide by zero and fixed it. Regression testing was successful; PGE 2 ran to completion with an exit code of 0. All output product files compared to the comparison files within zero percent.

The example above illustrates the level of detail. All problem test analyses should include the following information:

- Where testing occurred.
- What the problem was.
- Corresponding DDTs number.
- What caused the problem.
- Result of regression testing (should be the same as a nominal test analysis).

APPENDIX H: MAKEFILE STANDARDS

1. All makefiles shall use the following standard variable names in all makefiles as appropriate:

Variable	Meaning
INC	Include directories
TARGET	Target executable
LIB	Library directories
OBJ	Object files
CC	Compiler definition for C code
SYSTEM	System type
CFLAGS	Flags for the C compiler
F77	Compiler definition for FORTRAN 77
F77FLAGS	Flags for FORTRAN 77 compiler

2. Relative path names shall not be used in makefiles.

DON'T:	INC = ../include
DO:	INC = /ecs/MODIS/store/pge11G/include
OR	INC = $ (PGSINC)

3. All modifications that must be made to the makefile for the current environment (such as modifying a path name) shall be described in the README. A comment describing the required modification shall be placed in the makefile above the line that must be changed.

   EXAMPLE:

```
#  The following line must be changed for the target
environment
INC = /ecs/MODIS/store/pge11G/include
```

4. All makefiles shall have the standard ESDIS prolog format at the top of the makefile.

5. The makefile shall not redefine or modify any variables that are defined in the production environment (using them is OK). Variables currently defined in Release A are listed in Appendix E.

APPENDIX I: SOFTWARE DIRECTORY TREE

This directory structure shown in Figure I-1 represents the organization of the SDP S/W.

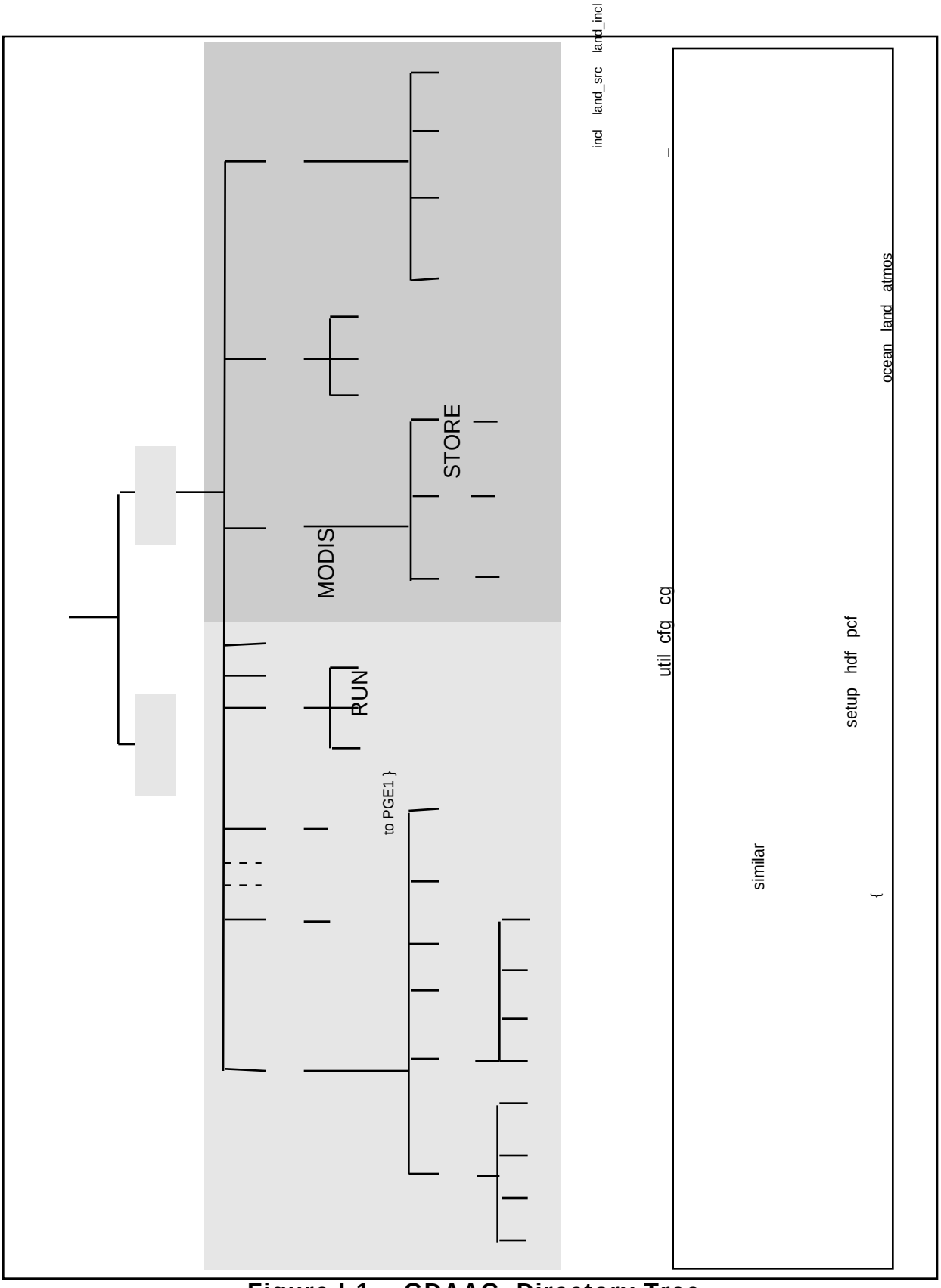
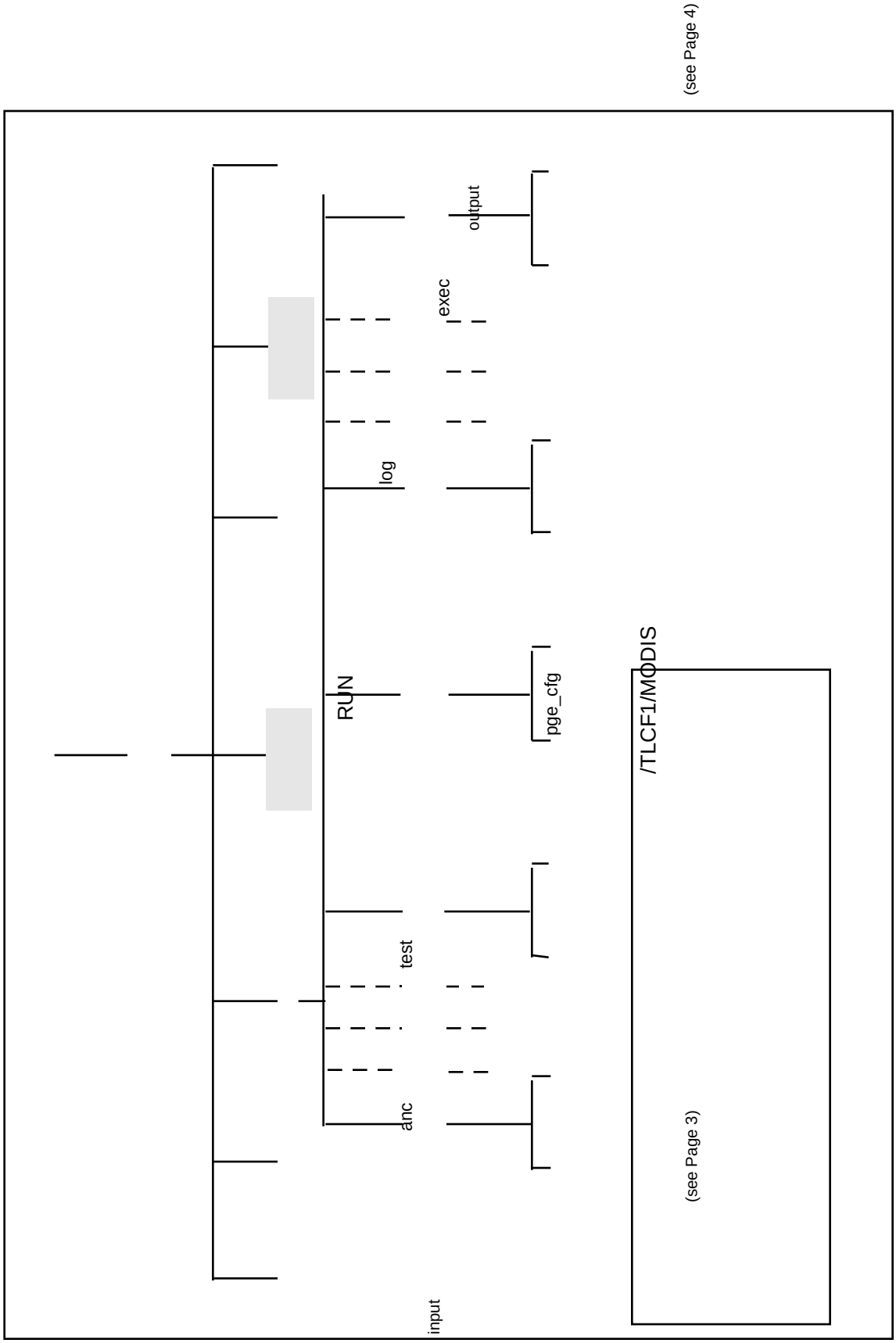
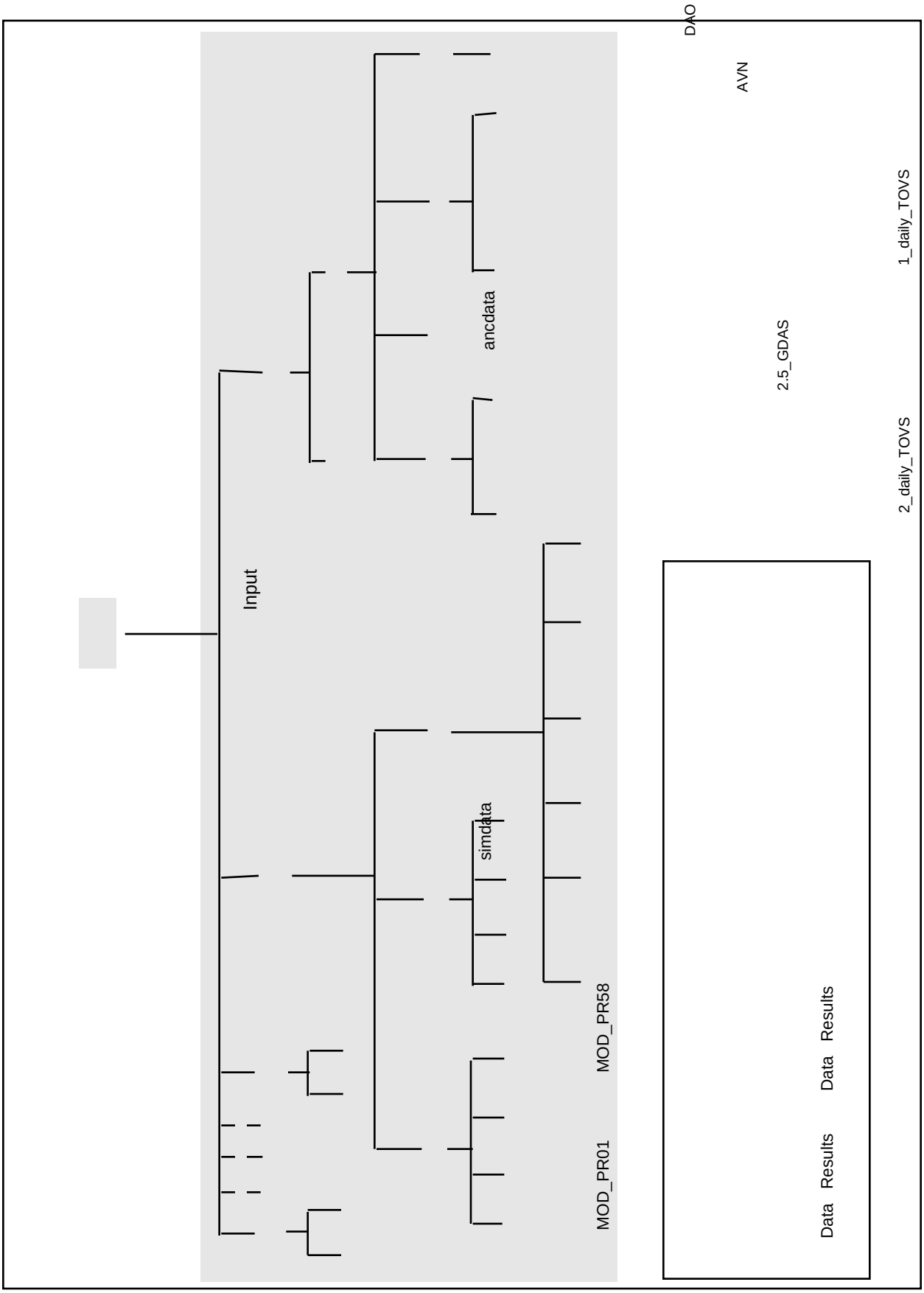
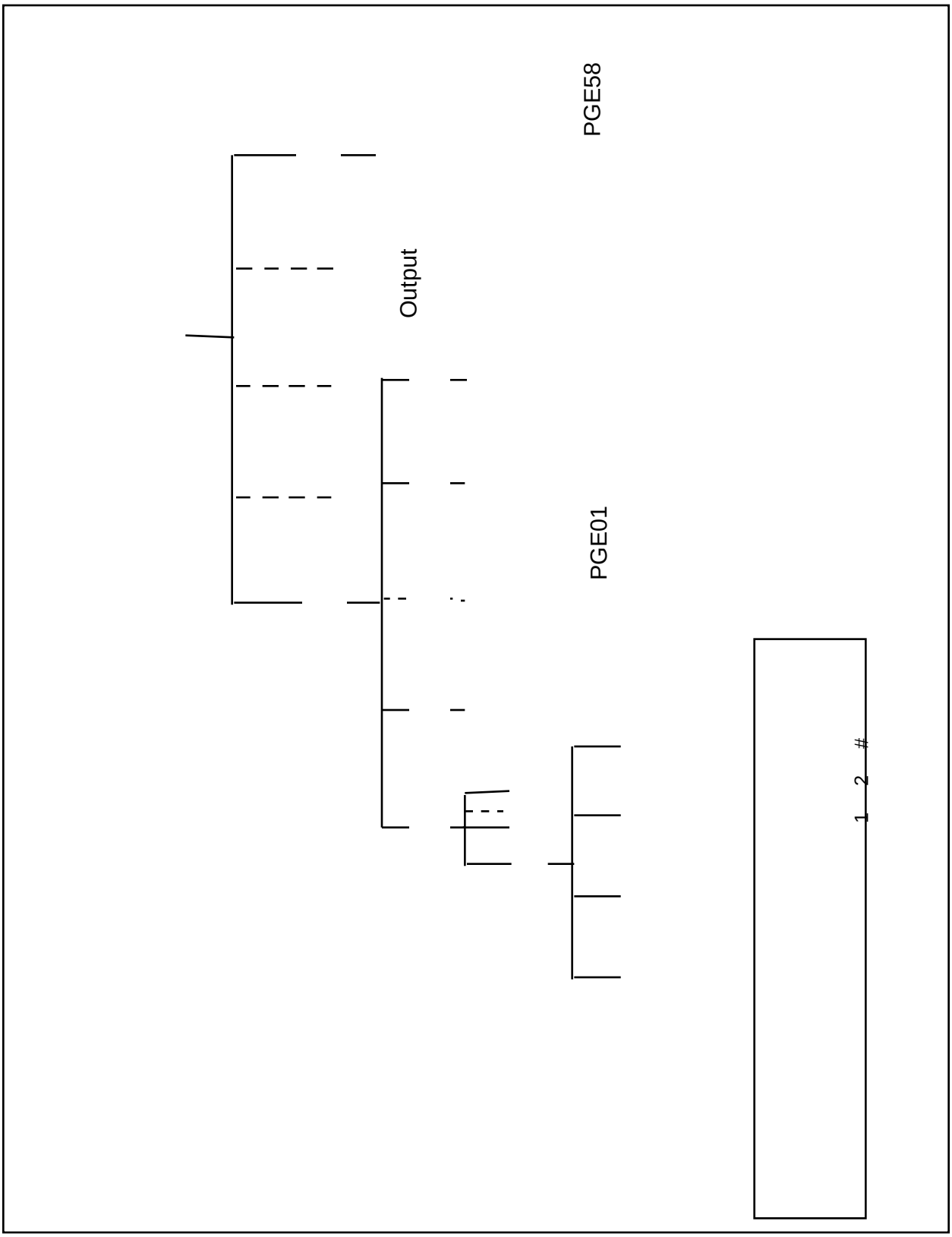


Figure I-1. GDAAC Directory Tree


(see Page 4)
output
exec
log
RUN
pge_cfg
/TLCF1/MODIS
test
anc
(see Page 3)
input


DAO
AVN
2.5_GDAS
1_daily_TOVS
2_daily_TOVS
ancdata
Input
simdata
MOD_PR58
MOD_PR01
Data Results
Data Results


PGE58
Output
PGE01
1 2 #